VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a minor, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards 9 VAC 25-260-10 et.seq. The discharge is a result of the operation of a municipal wastewater treatment plant treating sewage originating from a residential population of approximately 650 users. The coverage area will likely expand during the 2011 permit term, including an additional 988 residents. This permit action includes revised effluent limitations and special conditions in the permit.

1. Facility Name and Location Address: Reedville Sanitary District
154 Menhaden Drive (State Route 659)
Mailing Address: P.O. Box 14
Reedville, VA 22539

Facility/Owner Contact: Kenneth Eades
Title: Northumberland County Administrator
Mailing Address: P.O. Box 129
Heathsville, VA 22437
Telephone: (804) 508-7666
Email: keades@co.northumberland.va.us

Facility Operator: Sterling Lee Bowles, III
Plant Manager
(804) 453-3600

2. SIC Code: 4952

3. Permit No. VA0060712 Permit Expiration Date: March 27, 2010

4. Application Complete Date: Date: March 4, 2010
Permit Drafted By: Jeremy Kazio Date: November 29, 2010

DEQ Regional Office: Piedmont Regional Office

Reviewed By: Drew Hammond Date: December 21, 2010
Curt Linderman Date: March 22, 2011, April 7, 2011
Kyle Winter Date: June 30, 2011

5. Receiving Stream:

Name:	Cockrell Creek
River Mile:	7-COC001.41
Basin:	Cheapeake.Bay/Atlantic/Small Coastal Basins
Subbasin:	N/A
Section:	2
Class:	II
Special Standards:	a
1Q30 =	N/A
1Q10 =	N/A
7Q10 =	N/A
30Q10 =	N/A
30Q5 =	N/A
Tidal?	YES
On 303(d) list?	YES

6. Operator License Requirements: Class III
The recommended attendance hours by a licensed operator and the minimum daily hours that the treatment works should be manned by operating staff are contained in the Sewage Collections and Treatment Regulations (SCAT) 9 VAC 25-790-300. A class III licensed operator is required for this facility.

7. Reliability Class: Class I
Reliability is a measurement of the ability of a component or system to perform its designated function without failure or interruption of service. The reliability classification is based on the water quality and public health consequences of a component or system failure. The permittee is required to maintain Class I Reliability for this facility.

8. Permit Characterization:

( ) Issuance	(X) Existing Discharge
(X) Reissuance	( ) Proposed Discharge
( ) Revoke & Reissue	(X) Effluent Limited
( ) Owner Modification	(X) Water Quality Limited
( ) Board Modification	( ) WET Limit
( ) Change of Ownership/Name	( ) Interim Limits in Permit
Effective Date:	( ) Interim Limits in Other Document (attached)
(X) Municipal	( ) Compliance Schedule Required
SIC Code(s): 4952	( ) Site Specific WQ Criteria
( ) Industrial	( ) Variance to WQ Standards
SIC Code(s):	( ) Water Effects Ratio
(X) POTW	(X) Discharge to 303(d) Listed Segment
( ) PVOTW	( ) Toxics Management Program Required
( ) Private	( ) Toxics Reduction Evaluation
( ) Federal	( ) Possible Interstate Effect
( ) State	( ) Storm Water Management Plan

9. Wastewater Flow and Treatment:

Table 1

Outfall Number	Wastewater Source	Treatment	Flow
001	Residential with the possibility for commercial.	600,000 gallon emergency flow equalization basin, degritting sluices, Parshall flume flowmeter, comminutor, flow splitter, 2X 104,000 gallon extended aeration chambers (in parallel), 2X 43,000 gallon wiped floor gravity clarifiers, 3,000,000 gallon polishing pond, 2X gas chlorination/dechlorination, V-notch weir flowmeter, 2X effluent pump stations (pumped ~1/2 mile to Cockrell Creek), diffuser, sludge aeration digester, gravity sludge drying beds.	200,000 gpd (0.20 MGD) design capacity

Please see **Attachment A** for facility flow diagram.

10 Sludge Disposal: Wasted sludge is digested in a dedicated aeration chamber. Once it is determined that the sludge has been digested sufficiently, it is pumped to gravity sand bed filters for drying. Filtrate is directed to the head of the plant. Dried sludge is hand-raked from the drying beds, shoveled into a truck, and hauled to the Middle Peninsula Landfill and Recycling facility via Rt.360 west>Rt.200 south>Rt.3 south>Rt.33 west>Rt.17 south.

11. Discharge Location Description: This facility discharges to Cockrell Creek.
Name of USGS topo map: Reedville – 145D (See **Attachment B**)

12. Material Storage: Chemicals used for the wastewater plant are stored in proper containers and under roof cover. Chlorine gas tanks are contained within the Control Building.

13. Ambient Water Quality Information:
Data from station 7-COC001.61 were used in the 2011 reissuance for toxic pollutant limitation evaluations. Monitoring station 7-COC001.61 is located on Cockrell Creek at the end of Main Street in Reedville, approximately 0.2 mile upstream from the discharge. (See **Attachment C-1** and **Attachment E**)

14. Antidegradation Review and Comments:
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect those uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with a Tier determination. The receiving stream is considered a Tier 1 water because antidegradation was not applied during initial modeling for this facility. The wasteload allocations assigned to those discharges located on Cockrell Creek were developed to meet, not exceed, the dissolved oxygen criteria according to the Stream Sanitation Analysis completed by G.T. Yagel on 8/15/1979. (See **Attachment C-1** for Flow Frequency Analysis by J.Palmore dated April 12, 2010).

15. Site Inspection: By Michael Dare on February 25, 2009. (See **Attachment D**)

16. Effluent Limitation Development:

Table 2 – Limitations Basis

EFFLUENT CHARACTERISTICS	BASIS FOR LIMIT	DISCHARGE LIMITATIONS						MONITORING REQUIREMENTS	
		MONTHLY AVERAGE		WEEKLY AVERAGE		MIN	MAX	FREQUENCY	SAMPLE TYPE
Flow (MGD)	NA	NL		NA		NA	NL	1/Day	Totalizing, Indicating, & Reporting
pH (standard units)	1,4	NA		NA		6.0	9.0	1/Day	Grab
BOD_5	2	24 mg/L	18 kg/d	36 mg/L	27 kg/d	NA	NA	3 Days/Week	Grab
Total Suspended Solids (TSS)	2	24 mg/L	18 kg/d	36 mg/L	27 kg/d	NA	NA	1/Month	Grab
Total Residual Chlorine (TRC)	1	36 µg/L		41 µg/L		NA	NA	3/Day at 4 Hr. Intervals	Grab
Fecal Coliform	1	200 N / 100 mL (Geometric Mean)		NA		NA	NL	4/Month (between 10am and 4pm)	Grab
Enterococci	1	35 N / 100 mL (Geometric Mean)		NA		NA	NL	4/Month (between 10am and 4pm)	Grab
Total Phosphorus	3	2.0 mg/L	1500 g/d	NA		NA	NL	2/Month (>7 days apart)	Grab
Ammonia as N (interim)	1	2.42 mg/L		3.25 mg/L		NA	NA	3 Days/Week	Grab
Ammonia as N (final)	1	1.77 mg/L		2.38 mg/L		NA	NA	3 Days/Week	Grab
Dissolved Oxygen (DO)	1	NA		NA		5.0 mg/L	NA	1/Day	Grab

1. Water Quality Standards
2. Best Professional Judgment (BPJ)
3. Nutrient Regulations and DEQ Related Guidance
4. Federal Effluent Guidelines

- **Water Quality Based Effluent Evaluations:**

  If it is determined that a specific pollutant may exist in a facility's effluent, a Reasonable Potential Analysis must be conducted in order to determine if it is statistically probable that future discharges may contain that pollutant in concentrations which are harmful to the aquatic life or human health within the receiving stream. The first step of the analysis is determining the maximum concentration that may be discharged by the facility which will maintain the instream acute and chronic criteria contained in the *Virginia Water Quality Standards* (9 VAC 25-260 et.seq.). This maximum allowable pollutant concentration, called a wasteload allocation (WLA), is determined using a DEQ-created Excel spreadsheet deemed MSTRANTI, which requires inputs representing critical flow & water quality data for both the effluent and the receiving stream. The second step of the analysis utilizes another computer application named STATS 2.0.4 to calculate the lognormal distribution of the identified pollutant concentration using data submitted by the permittee as a sample set. The average and maximum 97th percentiles of the distribution are calculated and then compared to the WLA's determined earlier. If the 97th percentiles exceed the WLA's, a limitation is deemed to be necessary, which is also calculated by STATS 2.0.4 based on EPA-guidelines for the control of toxic pollutants. The MSTRANTI spreadsheet and applicable STATS 2.0.4 results for those pollutants listed in Table 3 above are contained in **Attachment E** of this fact sheet.

  Please note that an assumed value of 28 ˚C for the facility's effluent temperature was used due to unreliable data provided by the permittee for determination of seasonal temperature variation.

  For Total Residual Chlorine and Ammonia, GM 00-2011 requires that a concentration of 20 mg/L and 9 mg/L, respectively, be entered into STATS 2.0.4 as a data point in order to "bypass" the program's Reasonable Potential Analysis and calculate limitations since these pollutants are likely to exist in the facility's effluent. Results indicated that a more stringent limit for Ammonia of 1.71 mg/L, and for TRC of 36 µg/L, are needed to maintain Water Quality Standards (see **Attachment E**). Please note that the wasteload allocations entered into STATS for the TRC limit are actually for Chlorine Producing Oxidants (CPO). Chlorinated effluents discharged to salt water reacts to produce chlorine-produced oxidants (CPO) that have a toxic impact similar to TRC in freshwater. It is assumed that CPO in salt water receiving streams are controlled by the effluent TRC limit. Although the WLA's used in STATS are the same for both the 2005 permit and the 2011 permit, the the TRC limitation has become more stringent due to the increased monitoring frequency suggested in the Permit Manual (Section MN-2, Pg.2, rev.Jan. 27, 2010).

  Effluent sampling test results submitted by the permittee in Attachment A indicated that several pollutants were detectable at concentrations higher than the QL used by the laboratory or that an incorrect QL was reported. These pollutants include Chromium VI, Copper, Zinc, Heptachlor, Chloroform, Dichloromethane, and Dichlorobromomethane. All other pollutants were reported below their respective DEQ-acceptable QL. Chromium VI, Copper, and Zinc were evaluated utilizing the method explained in the first paragraph in this subsection with data submitted in Attachment A (see **Attachment E**). The results of each evaluation indicated that a limitation was not needed. The result submitted by the lab for Heptachlor was reported as <0.50 µg/L, which is above the DEQ-required QL of 0.05 µg/L. DEQ staff contacted the permittee's laboratory regarding this test result and discovered that a transcription error was made between the sample analysis results and the lab report for that pollutant. The lab sent a revised report directly to DEQ which indicates that Heptachlor was not detectable at a concentration equal to or higher than 0.02 µg/L (see **Attachment E**). No further evaluation for Heptachlor is required.

  Concentrations for parameters which do not have Aquatic Life water quality criteria are compared against any applicable Human Health criteria. Since the receiving stream to which this facility discharges is not considered a Public Water Supply (PWS) segment, only the respective "All Other Surface Waters" Human Health criteria listed in 9 VAC 25-260-140 B. were used to determine if further evaluation is required. To be as conservative as possible, the reported concentrations for these

parameters were compared directly against the Human Health Criteria rather than the calculated Human Health WLA's.

HUMAN HEALTH EVALUATION			
Parameter	Reported Concentration	Human Health Criteria (non-PWS)	Further Evaluation Required?
Chloroform	7.1 µg/L	11,000 µg/L	NO
Dichloromethane	6.5 µg/L	5,900 µg/L	NO
Dichlorobromomethane	6.1 µg/L	170 µg/L	NO

- **Limitation Rationale for BOD_5, TSS, DO, and Bacteria**

BOD_5 and TSS: Prior to this facility's construction, the State Water Control Board (SWCB) provided a letter, dated February 18, 1975, to the State Department of Health Division of Engineering (see **Attachment C-2**) recommending the following effluent limitations for the proposed "Sewerage – Reedville" discharge:

Parameter		Limits to Maintain Water Standards of Quality	Limits to Maintain Stream Use
Dissolved Oxygen	Daily Avg.	5.0 mg/L	
	Minimum	4.0 mg/L	
Temp. (rise above natural)	Sept.-May	4.0	
	June-Aug.	1.5	
pH		6.0-8.5	
Coliform Organisms		70/230 per 100 mL	
BOD_5			24 mg/L– 30 lbs/day
TSS			24 mg/L – 30 lbs/day
Residual Chlorine			2.0 – 2.5 mg/L
Dissolved Oxygen			6.0 mg/L

A few months later, the SWCB sent a letter to the Virginia Institute of Marine Science (VIMS), dated April 1, 1975, which requested VIMS to conduct a dye study on Cockrell Creek (see **Attachment C-3**) in order to: 1) determine the best point of discharge for the proposed Reedville Treatment Plant, 2) determine the dispersion characteristics of the proposed discharge with respect to tidal cycles, and 3) determine the possible effect on shellfish beds beyond the mouth of Cockrell Creek. In September 1976, VIMS completed the water quality study and concluded in their model that a $cBOD_5$ load of 5000 lbs./day could be added to the upper layer of Cockrell's Creek without degrading the in-stream dissolved oxygen criteria of 5.0 mg/L (daily average).

Within several years after the VIMS study, the allowable $cBOD_5$ load to Cockrell's Creek came under scrutiny among the three permitted dischargers on Cockrell's Creek (Ampro Fisheries, Zapata Protein, and Reedville Sanitary District), and it became necessary for the SWCB to apportion the $cBOD_5$ load among them. A memorandum by G.T. Yagel dated August 15, 1979 (see **Attachment C-4**) determined that 100 lbs./day of this $cBOD_5$ loading could be allocated to Reedville Sanitary District, with the remaining 4900 lbs/day being split between Ampro Fisheries and Zapata Protein. Reedville's $cBOD_5$ allocation was later confirmed in the *Cockrell's Creek WLA and Dilution Analysis* memorandum by Jon van Soestbergen dated September 17, 1998 (see **Attachment C-5**) that was conducted because Ampro Fisheries terminated their flow to Cockrell Creek and an analysis was necessary to determine how much of the $cBOD_5$ allocation was left for Zapata Protein (now Omega Protein).

A Stream Sanitation Analysis was conducted in 2003 due to Reedville's desire to be permitted at the treatment plant's true design capacity (see paragraph below). In a memorandum by Jennifer Palmore dated December 19, 2003 (see **Attachment C-6**), it was reaffirmed that the $cBOD_5$ allocation for Reedville Sanitary District of 100 lbs/day was still appropriate. The memorandum suggests that the concentration limits for $cBOD_5$ be equivalent to EPA's Federal Effluent Guidelines (FEG's) for secondary treatment due to the fact that the application of the allowable load allocation would have resulted in a $cBOD_5$ concentration limit less stringent than the FEG's. It also states that if the facility design capacity were to increase, the concentration limits should be adjusted accordingly in order to comply with the facility's allocated 100 lbs/day $cBOD_5$ load, and that TSS should be adjusted in the same proportion as $cBOD_5$ if necessary.

This facility's hydraulic design capacity has historically been 200,000 gallons per day. However, until the 2005 permit reissuance, the permit limitations and monitoring requirements were implemented as if the design capacity were 40,000 gallons per day. This was done at the permittee's request in order to alleviate the burden of additional monitoring required of facilities which operate much closer to their true design flows. During development of the 2005 permit, the permittee notified DEQ that they planned to expand their service area, and they requested that their permit reflect the true design capacity of the treatment plant. The BOD_5 and TSS concentration limits for this facility were historically set at 24 mg/L presumably due to the limitations originally recommended in the February 18, 1975 letter mentioned in the first paragraph of this section. The permit writer for the 2005 permit reissuance determined that the existing limit, despite being more stringent than the $cBOD_5$ load capacity assigned to the discharge or the FEG's, should be carried forward from prior permit reissuances to the 2005 permit reissuance in order to prevent backsliding. In the spirit of maintaining consistency with the 2005 permit, and due to antibacksliding policies, the 2005 limitation of 24 mg/L for BOD_5 and TSS has been carried forward to the 2011 permit reissuance.

DO: The most stringent applicable Dissolved Oxygen (DO) criteria contained in 9 VAC 25- 260-185 for Class II waters in the Chesapeake Bay includes a 30-day mean of >5mg/L, a 7-day mean of >4 mg/L, and an instantaneous minimum of >3.2 mg/L. A minimum daily concentration DO limit of 5.0 mg/L is expected to maintain both the mean and instantaneous water quality criteria, including minimal losses due to the distance traveled between the sampling point and the discharge point (~0.5 miles). A compliance schedule for this new limitation has not been provided as it is expected that the permittee will be able to fully comply with the permit limitation without the need for installation of additional equipment. The application submitted for the 2011 permit reissuance included reported concentrations for DO of 6.7 mg/L(average), and 9.4 mg/L (maximum), derived from a set of 20 samples.

Enterococci: The limitation for Enterococci is expected to protect the primary contact recreation use bacteria criteria outlined in 9 VAC 25-260-170 (Water Quality Standards). The primary contact recreation bacterial criteria for protection of saltwater is 35N/100 mL colony forming units (CFU) of Enterococci bacteria based on a monthly geometric mean resulting from at least 4 weekly samples. The 2005 permit reissuance incorporated this limitation for Enterococci, but allowed the permittee the option of performing a Bacteria Demonstration Study. If the requirements of the Study were met, the permittee would have been allowed to eliminate the bacterial limitation in lieu of utilizing chlorine concentration to demonstrate that proper disinfection was being performed. However, the permittee did not complete the study within the required timeframe, and therefore, the Enterococci limit became effective at the end of the compliance schedule in 2009. The limit has been carried forward to the 2011 permit reissuance.

Fecal Coliform: For sewage discharges that may reach shellfish waters, permits limit fecal coliform with an effluent limit of 200 colony forming units per 100 milliliters, applied as a monthly geometric mean. Although the Water Quality Standards have been amended to remove the reference to this effluent limit in shellfish waters, the Virginia Department of Health, Bureau of Shellfish Sanitation still uses fecal coliform as an indicator for determining the quality of shellfish waters, and it is necessary to ensure discharges meet this level. Since it has historically maintained the in-stream water quality criteria for fecal coliform of 14/43 per 100 milliliters, the 200 per 100 milliliters effluent limit will be

used in shellfish waters in order to continue meeting the in-stream criteria and for protection of shellfish under the general standard.

- **Limitation Rationale for Total Phosphorus**

  Total Phosphorus: At the time of construction, the Reedville Sanitary District facility was designed to treat wastewater up to a design flow of 0.20 MGD. However, prior to 2005, the permittee asked DEQ, and DEQ agreed, to be permitted at a design flow of 0.040 MGD in order to reduce the monitoring frequencies of limited parameters as well as the fact that the plant's service area was small and the influent to the facility was relatively low. During the 2005 reissuance, the permittee requested that their permitted design flow reflect the true design flow of the plant (0.20 MGD) in order to implement plans to expand the service area of the treatment facility. Since the recognized design flow of the facility changed with respect to permitting practices, the receiving stream model was reevaluated and limitation evaluations were carried out accordingly. In addition, the reversion of the recognized design flow back to 0.20 MGD prompted revisiting 9 VAC 25-40-30 (*Policy for Nutrient Enriched Waters*), which required the inclusion of a concentration limit for Total Phosphorus (TP) of 2.0 mg/L for facilities with a design capacity of greater than 0.050 MGD permitted after July 1988. It should be noted that this regulation was amended in November 2005 to exclude the aforementioned criteria due to key changes made to § 62.1-44.19:15 of the *Code of Virginia* (as of July 1, 2005). Since the facility's design capacity was considered to be greater than 0.10 MGD, the permitted discharge was placed on the Chesapeake Bay Program-Significant Dischargers List (CBP-SDL), and consequently prompted the need to include monitoring requirements for several additional nutrient parameters in accordance with Guidance Memo 04-2017 (*Nutrient Monitoring and Maximum Annual Loads for VPDES Permitted Facilities on the DEQ Chesapeake Bay Program's List of Significant Discharges*).

  Due to changes made to 9 VAC 25-40 (*Policy for Nutrient Enriched Waters*), 9 VAC 25-720 (*Water Quality Management Plan*), § 62.1-44.19:15 of the *Code of Virginia* (as of July 1, 2005), and *9 VAC 25-820* (*General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia)*, the nutrient parameters which required monitoring-only were removed from the permit in 2007 in lieu of the monitoring requirements of this facility's Watershed General Permit (VAN020101). However, due to antibacksliding policies, the Nutrient Enriched Waters (NEW)-based concentration limitation for Total Phosphorus remained in the individual permit.

  Since it's inclusion in the 2005 permit reissuance, the permittee has not been able to consistently comply with the above TP concentration limitation (see Item 25.a. of this fact sheet). DEQ staff requested a meeting with the permittee and the permittee's engineering consultant on May 4, 2010 in order to discuss the permittee's plans regarding compliance with the nutrient loading limitations contained their Watershed General Permit (VAN020101), as well as plans for complying with their 2005 TP concentration limit. During the meeting, as well as in a subsequent letter dated May 10, 2010 (see **Attachment F**), the permittee indicated that, due to lack of funding, they cannot afford to upgrade the treatment facility in order to meet the nutrient waste load allocations (WLA's) of the Watershed General Permit and that they planned to fully offset the WLA's by purchasing nutrient exchange credits. Regarding compliance with their NEW-based Total Phosphorus concentration limitation, the permittee stated that they planned to include chemical addition in order to meet a TP concentration of 2.0 mg/L monthly average.

  According to agency guidance, GM07-2008, Amendment 2 (Page 16), the individual permit should include annual TP concentration limitations in cases in which the technology was installed to meet limits that were based on a Nutrient Enriched Waters designation. Since the permittee has provided documentation indicating that chemical feed will be used to meet the 2005 NEW-based Total Phosphorus concentration limit, and chemical feed is considered a form of installable nutrient reduction technology, a concentration limit of 2.0 mg/L is being included in the 2011 permit reissuance. Upon the advice of DEQ Central Office staff, based on best professional judgment and the need for a conservative approach to address historical NEW non-compliance issues, rather than

an annual average concentration effective with the calendar year following permit re-issuance, TP limitations were retained and carried forward from the 2005 permit as a monthly average effective immediately with permit reissuance.

- **Additional Note Regarding Sample Type for BOD_5, TSS, Total Phosphorus & Ammonia:** During drafting of the 2005 permit, the permittee requested to be allowed to collect grab samples rather than the agency recommended 8 hour composite samples for these parameters (see **Attachment G**). Although the permittee did not make the same request for the 2011 permit reissuance, staff recommends continuing to allow grab sampling for linearity purposes. Neither the polishing pond nor the sampling point has changed since the 2005 permit reissuance, and the requirement to collect effluent samples after the polishing pond will be carried forth from the 2005 permit to the 2011 permit (Part I.A.3).

  The intention of collecting a composite sample (over grab sampling) is to obtain a representation of the conglomerated effect of daily variations in effluent quality due to typical changes in the influent to the treatment works as well as environmental factors and treatment variability. At a volume of 3,000,000 gallons, the polishing pond theoretically provides a retention time of approximately 15 days at 100% of the facility's design flow. It can be safely assumed that any influent to the polishing pond is thoroughly mixed with influent at least as old as 24 hours, therefore grab samples taken after the polishing pond meet or exceed the objective of collecting 8 hour composite samples.

17. Basis for Sludge Use & Disposal Requirements: Not applicable, as this facility does not land apply sludge.

18. Antibacksliding: All limitations in the proposed 2011 permit reissuance are the same or more stringent than the limitations in the 2005 permit issuance.

19. Special Conditions:

Part I.B. - Additional Chlorine Limitations and Monitoring Requirements

Rationale: Required by Sewage Collection and Treatment Regulations, 9VAC25-790 and *Water Quality Standards 9VAC25-260-170, Bacteria; Other Recreational Waters*. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This ensures proper operation of chlorination equipment to maintain adequate disinfection.

Part I.C - Compliance Schedule

Rationale: The VPDES Permit Regulation at 9 VAC 25-31-250 allows for schedules that will lead to compliance with the Clean Water Act, the State Water Control Law, and regulations promulgated under them. A compliance schedule has been provided for Ammonia in the 2011 permit reissuance. A compliance schedule for DO has not been provided as it is expected that the permittee will be able to fully comply with the permit limitation without the need for installation of additional equipment. The application submitted for the 2011 permit reissuance included reported concentrations for DO of 6.7 mg/L average and 9.4 mg/L maximum derived from a data set of 20 samples

Part I.D.

a. Special Condition D.1 – 95% Capacity Reopener
   Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 4 for all POTW and PVOTW permits.

b. Special Condition D.2 – O&M Manual Requirement
   Rationale: Required by Code of Virginia§62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

c. Special Condition D.3 – Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C and the Code of Virginia § 54.1-2300 et seq., Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators.

d. Special Condition D.4. – Reliability Class
Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

e. Special Condition D.5 – Sludge Use and Disposal
Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B 2, and 420 through 720; and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

f. Special Condition D.6. – Sludge Reopener
Rationale: Required by VPDES Permit Regulation 9 VAC 25-31-220 C for all permits issued to treatment works treating domestic sewage.

g. Special Condition D.7 – Compliance Reporting
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limitation or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

h. Special Condition D.8 – Materials Handling/Storage
Rationale: 9 VAC 25-31-50 A prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia §62.1-44.16 and 62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

i. Special Condition D.9 - Total Maximum Daily Load (TMDL)/Nutrient Reopener
Rationale: Section 303(d) of the Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to Section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed it they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9 VAC 25-31-390 A authorizes DEQ to modify VPDES permits to promulgateamended water quality standards.

j. Special Condition D.10—Indirect Dischargers
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B.1.& B.2.for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

k. Special Condition D.11 – CTO, CTC Requirement
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790-50. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.

m. Special Condition D.12 - Treatment Works Closure Plan

Rationale: §62.1-44.19 of the State Water Control Law. This condition establishes the requirement to submit a closure plan for the wastewater treatment facility if the treatment facility is being replaced or is expected to close.

n. Special Condtion D.13 – Pretreatment Program
Rationale: VPDES Permit Regulation, 9VAC25-31-730 through 900, and 40 CFR part 403 require certain existing and new sources of pollution to meet specified regulations.

20. Part II, Conditions Applicable to All VPDES Permits
The VPDES Permit Regulation at 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

21. Changes to 2005 Permit:

Table 3: Permit Processing Change Sheet

Parameter Changed	**Effluent Limits Changed** From	To	**Monitoring Requirement Changed** From	To	**Reason for Change**	**Date**
• Total Nitrogen • Total Nitrogen (kg/month) • Total Nitrogen (kg/calendar year) • TKN • Nitrate+Nitrite • Total Phosphorus (kg/month) • Total Phosphorus (kg/calendary year) • Orthophosphate	Monitoring Only	Removed	1/Month 2/Month	Removed	Due to changes made to 9 VAC 25-40 (*Policy for Nutrient Enriched Waters*), 9 VAC 25-720 (*Water Quality Management Plan*), § 62.1-44.19:15 of the *Code of Virginia* (as of July 1, 2005), and *9 VAC 25-820* (*General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia)*, the nutrient parameters which required monitoring-only were removed from the permit in 2007 in lieu of the monitoring requirements of this facility's Watershed General Permit (VAN020101).	10/10
Total Residual Chlorine (TRC)	39 µg/L Mo.Avg. 47 µg/L We.Avg	36 µg/L Mo.Avg. 41 µg/L We.Avg.	1/Day	3/Day at 4 Hr. Intervals	A limitation evaluation was conducted as described in Item 16 of this fact sheet which resulted in the determination that a more stringent TRC limitation was necessary for the 2011 permit re-issuance. Monitoring frequency changed to reflect current agency guidance (Permit Manual, MN-2, Page 2, rev.1/27/2010).	
Fecal Coliform	200 N/100 mL (geometric mean)	200 N/100 mL (monthly average)	3/Week	4/Month (between 10 am and 4 pm)	Limitation and monitoring frequency changed in accordance with current agency guidance (Permit Manual, Section MN-3, Pg. 37-38, rev. January 27, 2010).	
Enterococci	--	35 N/100 mL (Geometric Mean)	--	4/Month (between 10 am and 4 pm)	See Item 16 of this fact sheet and below for further description.	
Total Phosphorus	2.0 mg/L 1.5 kg/d	No Change 1500 g/d	2/Month	2/Month (> 7 days apart)	Loading limitations are expressed as whole numbers in 2 significant figures in accordance with GM06-2016. Monitoring frequency modified to match the permittee's Watershed GP (VAN020101)	

Parameter Changed	Effluent Limits Changed From	Effluent Limits Changed To	Monitoring Requirement Changed From	Monitoring Requirement Changed To	Reason for Change	Date
Ammonia	2.4 mg/L Mo.Avg.	1.71 mg/L Mo.Avg.	3 Days / Week	No Change	A limitation evaluation was conducted as described in Item 16 of this fact sheet which resulted in the determination that a more stringent Ammonia limitation was necessary for the 2011 permit re-issuance.	
	3.2 mg/L We.Avg.	2.30 mg/L We.Avg.				
Dissolved Oxygen	--	5.0 mg/L Minimum	--	1/Day	A dissolved oxygen limitation has been added in order to protect Water Quality Standards. See Item 16 of this fact sheet for more information.	

Table 3: Permit Processing Change Sheet (continued): Special Conditions

From	To	Special Condition Changed	Reason for Change	Date
Part I.A.1.a	Part I.A.1(a)	Design Flow	Wording changed for acuity purposes.	10/10
--	Part I.A.1(b)	Significant Figures	New, reflects changes made in agency procedure due to GM06-2016	
Part I.A.1.c	Part I.A.1(c)	Compliance Schedule Reference	Revised for acuity purposes and to reflect removal of nutrient monitoring parameters.	
Part I.A.1.d	Part I.A.1(d)	Additional TRC Requirements	Revised for acuity purposes.	
--	Part I.A.1(e)	Bacterial Monitoring Criteria	New, regional addition in order to enhance monitoring frequency criteria description for bacteria defined in the current Permit Manual (rev.January 27, 2010).	
--	Part I.A.1(f)	Watershed GP Reference	New, added to reflect current agency guidance for significant dischargers of nutrients (GM07-2008, Amnd.2)	
Part I.A.2	Part I.A.2	No Discharge Solids/Foam	No Change	
Part I.A.4	Part I.A.3	Sample location	Revised for acuity purposes.	
Part I.A.3	Part I.A.4	85% Removal BOD_5 & TSS	No change	
Part I.B.1	Part I.B	Additional TRC Limitations and Monitoring Requirements	Bacteria Demonstration requirements removed. Wording revised for acuity purposes.(see Part I.B.2 removal description below)	
Part I.C	Part I.C	Compliance Schedule	Requirement for Ammonia revised to reflect 2011 permit limit. Total Phosphorus requirements removed. Wording revised to reflect current agency guidance (Permit Manual, rev. January 27, 2010)	
Part I.D.1	Part I.D.1	95% Capacity Notification	DEQ-PRO address has been removed	
Part I.D.4	Part I.D.2	O & M Manual	Revised to reflect current Permit Manual (rev. January 27, 2010)	
Part I.D.5	Part I.D.3	Licensed Operator	No changes	
Part I.D.6	Part I.D.4	Reliability Class	No changes	
Part I.D.10	Part I.D.5	Sludge Use and Disposal	Revised wording to reflect current Permit Manual (rev. January 27, 2010)	
Part I.D.7	Part I.D.6	Sludge Reopener	No changes	
Part I.D.9	Part I.D.7	Compliance Reporting	Revised to reflect current Permit Manual (rev. January 27, 2010). Language further revised according to regional procedure and for clarity purposes and to account for any monitoring-only parameters.	
Part I.D.11	Part I.D.8	Materials Handling/Storage	No changes	
Part I.D.8	Part I.D.9	TMDL/Nutrient Reopener	Language revised to reflect current agency guidance (GM07-2008). Revised language addresses both nutrient reopener and TMDL reopener.	

From	To	Special Condition Changed	Reason for Change	Date
Part I.D.2	Part I.D.10	Indirect Dischargers	No changes	
Part I.D.3	Part I.D.11	CTC, CTO Requirement	Revised wording to reflect current Permit Manual (rev. January 27, 2010) and current nutrient guidance (GM07-2008, Amnd.2)	
--	Part I.D.12	Treatment Works Closure Plan	New, reflects SCAT regulations requirements (9 VAC 25-790-120 E.)	
Part I.D.15	Part I.D.13	Pretreatment Program	Wording revised to reflect current Permit Manual (rev. January 27, 2010)	
Part I.A.1.b	Removed	Totalizing, Indicating, and Reporting Equipment	Incorporated into the Part I.A.1 limitations and monitoring table.	
Part I.A.1.e	Removed	Compliance Reporting Special Condition Reference	Unnecessary	
Part I.A.1.f	Removed	Total Nitrogen Calculation Instructions	Total Nitrogen monitoring has been removed from the 2011 permit in lieu of monitoring under the Watershed GP	
Part I.A.1.g	Removed	2/Month Monitoring Instructions	All parameters requiring 2/Month monitoring have been removed from the 2011 permit.	
Part I.A.h	Removed	Nutrient Reporting Requirements reference	Annual Nutrient reporting has been removed from the 2011 permit.	
Part I.B.2	Removed	Bacteria / Disinfection Demonstration	This facility was given instructions to complete a bacterial demonstration study for Enterococci within the first year of the 2005 permit reissuance. If the facility was able to meet the conditions set by the bacterial demonstration study's instructions, then an Enterococci limitation would not be required. According to DEQ-PRO's records, the permittee did not complete this study within the time frame given. Therefore the Enterococci limit has become effective.	
Part I.D.12	Removed	Nutrient Reporting Requirements	Removed to due to changes made to 9 VAC 25-40 (*Policy for Nutrient Enriched Waters*), 9 VAC 25-720 (*Water Quality Management Plan*), § 62.1-44.19:15 of the *Code of Virginia* (as of July 1, 2005), and *9 VAC 25-820* (*General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia)*. These requirements have general been accounted for in this facility's Watershed General Permit (VAN020101)	
Part I.D.13	Removed	Basis of Design Report and Interim Measures for optimization of nutrient removal or alternatives		
Part I.D.14				
Part I.D.17	Removed	35 Additional Water Quality Monitoring Parameters	Water quality monitoring is now required to be submitted with a permittee's application for reissuance.	
The structure and language of the cover page have been slightly modified in accordance with new agency procedures and for streamlining purposes. Signatory requirements have also changed in accordance with the October 2008 DEQ Agency Policy Statement 2-09, "Delegations of Authority". Facility address changed from 152 Menhaden Road to 154 Menhaden Road as reflected in the 2011 permit reissuance application submitted by the permittee. Special Standard NEW-20 removed in accordance with the current Water Quality Standards (January 6, 2011).				

22. Variances/Alternate Limits or Conditions: None.

23. Public Notice Information required by 9 VAC 25-31-280 B:

Comment period: Start Date: June 1, 2011 End Date: July 5, 2011
Published Dates: June 1, 2011 and June 8, 2011
Name of Newpaper: *Northumberland Echo*

All pertinent information is on file and may be inspected or copied by contacting Jeremy Kazio at:

Virginia Department of Environmental Quality (DEQ)
Piedmont Regional Office
4949-A Cox Road
Glen Allen, Virginia 23060-6296

Telephone Number 804/527-5044
Facsimile Number 804/527-5106
Email Jeremy.Kazio@deq.virginia.gov

DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. The public may review the draft permit and application at the DEQ Piedmont Regional Office by appointment.

24. Total Maximum Daily Load (TMDL): This facility discharges directly to tidal Cockrell Creek. During the 2008 Water Quality Assessment, the portion of Cockrell Creek to which Reedville discharges was assessed as a Category 5A water body ("A Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).") The segment was impaired of the Fish Consumption Use due to a 12/13/2004 VDH Fish Consumption Advisory for PCBs in the Chesapeake Bay and its tidal tributaries, and the entire Chesapeake Bay Mesohaline segment (CB5MH) failed the Aquatic Life Use's submerged aquatic vegetation criteria. The Wildlife and Recreation Uses were not assessed and the Shellfish Consumption Use was considered to be removed due to a VDH prohibition.

The bacterial TMDL for Cockrell Creek was approved by the EPA on 12/8/2008 and by the SWCB on 4/28/2009. The Reedville STP did not receive a wasteload allocation because the Shellfish Consumption Use is not applicable in the area around the outfall, as discussed above. No limit for PCB's is included in this permit because the effluent does not contain PCB's according to data submitted in the Water Quality Criteria Monitoring with the 2011 permit reissuance application (see "Attachment A" results in **Attachment E** of this fact sheet).

25. Additional Comments:

a. Previous Board Action:

As of the drafting of this 2011 permit reissuance, the permittee was issued Warning Letters on 5/4/2006, 01/29/2008, 09/03/2009, 02/09/2009, and 03/13/2009. The permittee was also issued Notices of Violation on 5/28/2009, 08/09/2009, 11/13/2009, 05/14/2010, and 10/08/2010. These letters relate to violations of the 2005 Total Phosphorus limitation as well as other violations. A Consent Order is currently being drafted.

b. Staff Comments:

- A monitoring frequency reduction was not considered for this facility due to non-exemplary performance in attainment of limited pollutants during the 2005 permit cycle.
- Financial assurance does not apply to this facility because it is publicly owned.
- Coordination with the Virginia Department of Health –Division of Shellfish Sanitation indicated that the existing discharge would not cause any change to the existing shellfish closures within this facility's receiving water body.
- This permit reissuance is non-controversial. The staff believes that the attached effluent limitations will maintain the Water Quality Standards adopted by the Board.
- The discharge is in conformance with the existing planning documents for the area.
- EPA has waived the right to comment and/or object to the adequacy of the permit.

- The permittee last paid their annual maintenance fee on 9/20/2010.

- The permittee was notified of the expectation to participate in the e-DMR program on 10/18/2010. The PRO's compliance auditor received the e-DMR application from the permittee on 11/15/2010 (confirmed by email from P.Bishop dated 11/16/2010). The permittee does not participate in the VEEP.

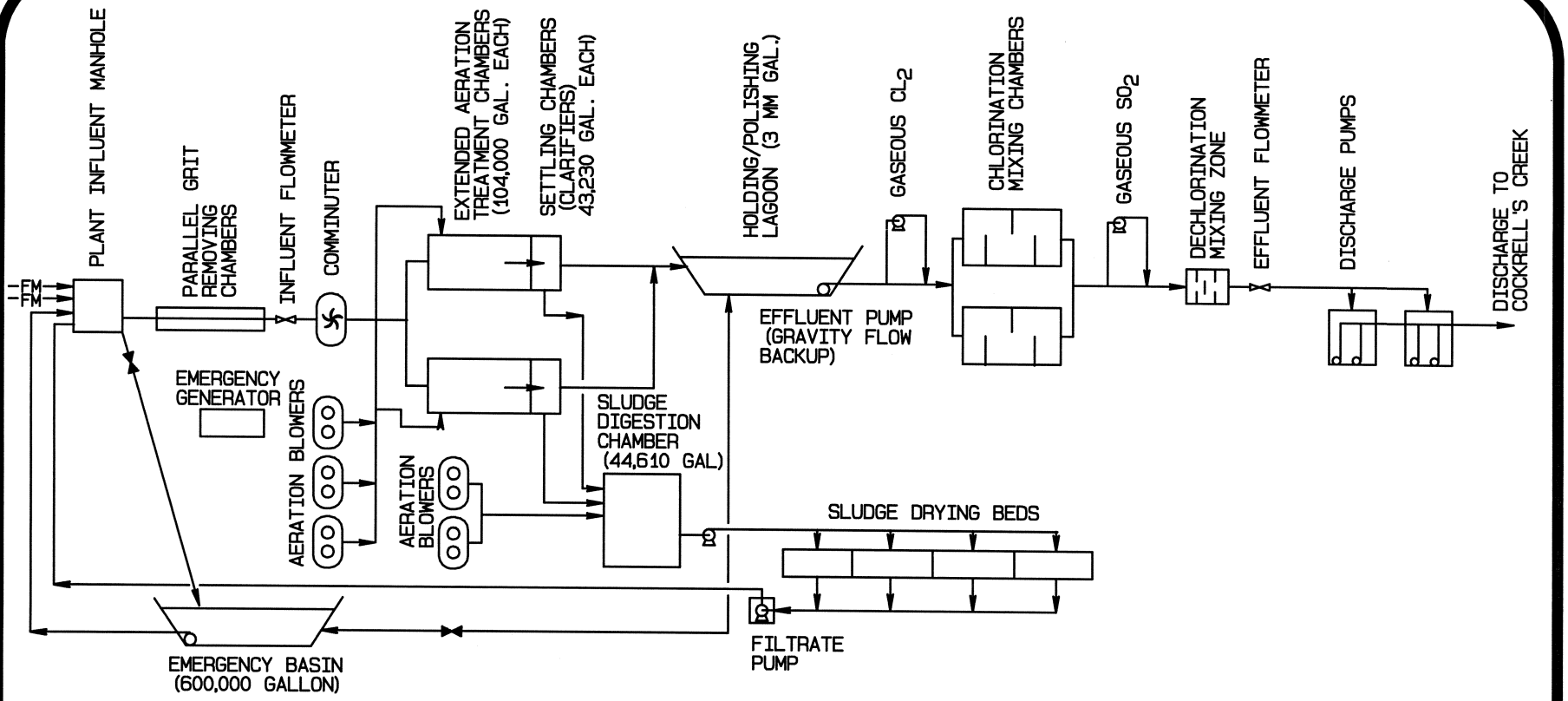
c. Public Comments: None

26. Summary of attachments to this Fact Sheet:

Attachment A	Flow Diagram
Attachment B	Location Map
Attachment C	Flow Frequency Analysis, Stream Sanitation Analysis, and CORMIX Evaluation
Attachment D	Site Inspection Report
Attachment E	Effluent Data, Ambient Stream Data, and Limitation Evaluations
Attachment F	Letter from Permittee Addressing Nutrients
Attachment G	2003 Email Permitting Grab Sampling in Lieu of Composite Sampling

Attachment A

Flow Diagram



NOTES:

1. DESIGN FLOW 200,000 GPD.

FIGURE 3
REEDVILLE WWTF
FLOW DIAGRAM
NORTHUMBERLAND COUNTY

RESOURCE INTERNATIONAL, LTD.

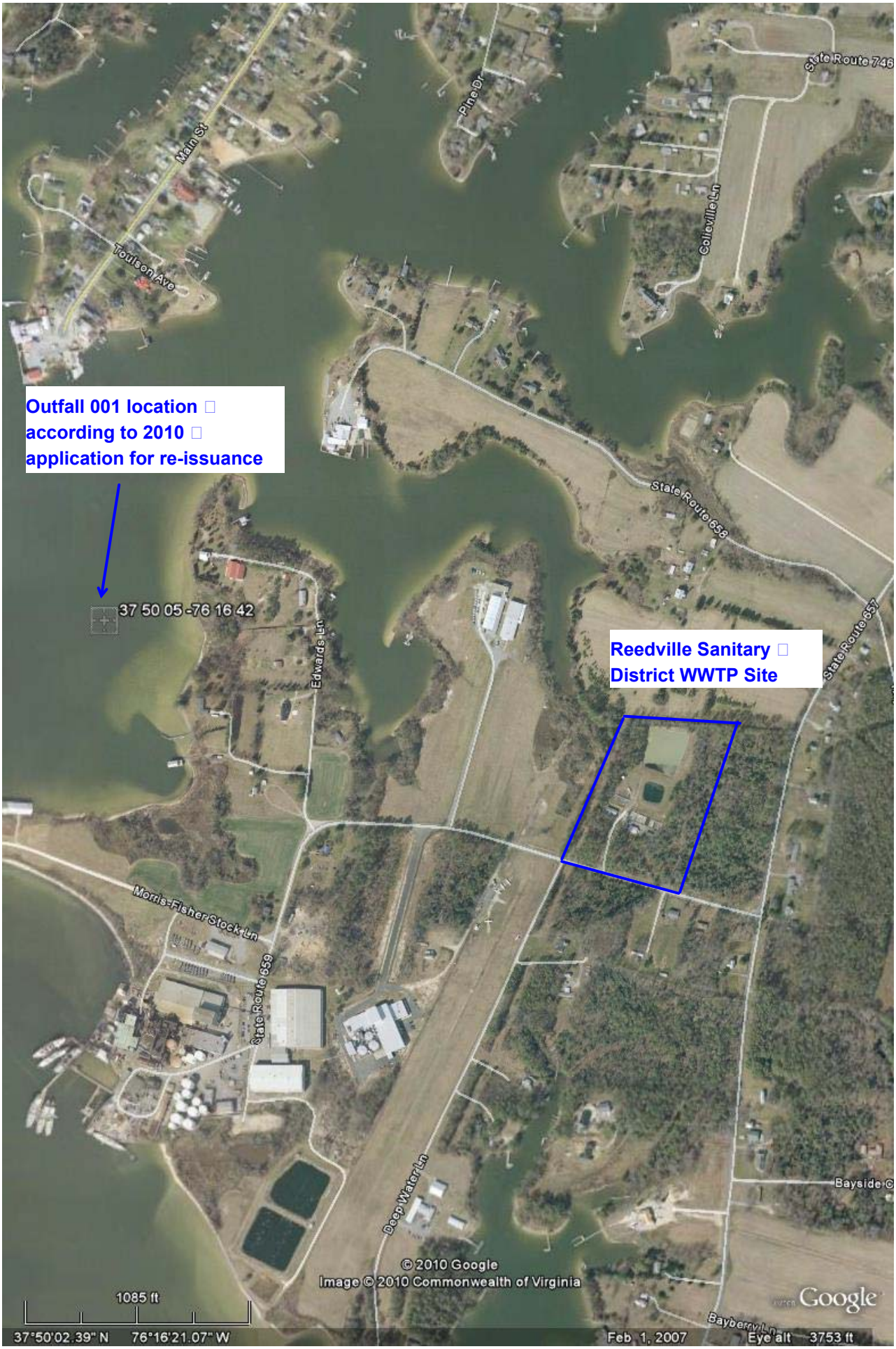
ENGINEERS ○ SCIENTISTS ○ SURVEYORS ○ PLANNERS

P.O. BOX 6160 ○ 9560 KINGS CHARTER DRIVE ○ ASHLAND, VA 23005
(804) 550-9200 ○ FAX (804) 550-9259

11/2/2009 11:56:01AM
H:\99038.15 Reedville WWTP Nutrient Reduction Upgrades\WWTFPNID.pro

Attachment B

Location Map


Outfall 001 location according to 2010 application for re-issuance
37 50 05 -76 16 42
Reedville Sanitary District WWTP Site
Main St
Toulson Ave
Pine Dr
State Route 746
Coleville Ln
State Route 658
State Route 657
Edwards Ln
Morris-Fisher Stock Ln
State Route 659
Deep Water Ln
Bayside
Bayberry Ln
© 2010 Google
Image © 2010 Commonwealth of Virginia
1085 ft
37°50'02.39" N 76°16'21.07" W
Feb 1, 2007
Eye alt 3753 ft
Google

Attachment C

Flow Frequency Analysis, Stream Sanitation Analysis, and CORMIX evaluation

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Reedville Sanitary District STP – VA0060712

TO: Jeremy Kazio

FROM: Jennifer Palmore, P.G.

DATE: April 12, 2010

COPIES: File

The Reedville Sanitary District's sewage treatment plant discharges to Cockrell Creek in Northumberland County, VA. The outfall is located at rivermile 7-COC001.41. Flow frequencies have been requested at this site for use in developing effluent limitations for the VPDES permit.

Cockrell Creek is tidally influenced at the discharge location. Flow frequencies cannot be determined for tidal waters, therefore the CORMIX dilution ratios from Allan Brockenbrough's December 31, 2003 memorandum should be used. Modeling determined that an acute WLA multiplier of 6.0 (5 parts Cockrell Creek and 1 part effluent) and a chronic WLA multiplier of 14.3 are appropriate.

During the 2008 Water Quality Assessment, the portion of Cockrell Creek to which Reedville discharges was assessed as a Category 5A water body ("A Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).") The segment was impaired of the Fish Consumption Use due to a 12/13/2004 VDH Fish Consumption Advisory for PCBs in the Chesapeake Bay and its tidal tributaries, and the entire Chesapeake Bay Mesohaline segment (CB5MH) failed the Aquatic Life Use's submerged aquatic vegetation criteria. The Wildlife and Recreation Uses were not assessed and the Shellfish Consumption Use was considered to be removed due to a VDH prohibition. The applicable fact sheets are attached.

The bacterial TMDL for Cockrell Creek was approved by the EPA on 12/8/2008 and by the SWCB on 4/28/2009. The Reedville STP did not receive a wasteload allocation because the Shellfish Consumption Use is not applicable in the area around the outfall, as discussed above.

Data from station 7-COC001.61 is attached. The station is located on Cockrell Creek at the end of Main Street in Reedville. It is approximately 0.2 mile upstream from the discharge.

Cockrell Creek is considered a Tier 1 water. Antidegradation was not applied during initial modeling for this facility and wasteload allocations were developed to meet, not surpass, the dissolved oxygen criteria (G.T. Yagel, 8/15/1979).

Cockrell Creek is designated as saltwater and the Aquatic Life saltwater criteria should be applied.

If you have any questions concerning this analysis, please let me know.

*Appendix A - List of Impaired (Category 5) Waters in 2008**

Chesapeake Bay/Atlantic/Small Coastal Basins

Cause Group Code **CB5MH-SAV-BAY** **Chesapeake Bay segment CB5MH**

Location: This cause encompasses the complete CBP segment CB5MH.

City / County: Chesapeake Bay - Co Lancaster Co. Northumberland Co.

Use(s): Aquatic Life Shallow-Water Submerged Aquatic Vegetation

Cause(s) / VA Category: Aquatic Plants (Macrophytes) / 5A

The acres of submerged aquatic vegetation (SAV) mapped through aerial surveys does not meet the criteria in segment CB5MH. There is insufficient data to assess the water clarity criteria.

Chesapeake Bay segment CB5MH **Aquatic Life**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Aquatic Plants (Macrophytes) - Total Impaired Size by Water Type:	**213.497**		

Chesapeake Bay segment CB5MH **Shallow-Water Submerged Aquatic Vegetation**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Aquatic Plants (Macrophytes) - Total Impaired Size by Water Type:	**213.497**		

Sources:

Agriculture	Atmospheric Deposition - Nitrogen	Clean Sediments	Industrial Point Source Discharge
Internal Nutrient Recycling	Loss of Riparian Habitat	Municipal Point Source Discharges	Sediment Resuspension (Clean Sediment)
Sources Outside State Jurisdiction or Borders	Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)		

2008 Fact Sheets for 303(d) Waters

RIVER BASIN: Chesapeake Bay/Atlantic/Small Coastal Basins **HYDROLOGIC UNIT:** 02080102

STREAM NAME: **Chesapeake Bay and Tidal Tributaries**

TMDL ID: **C01E-17-PCB** **2008 IMPAIRED AREA ID:** CB-CB5MH

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2018

IMPAIRED SIZE: 1,857.071 - Sq. Mi. **Watershed:** VAP-C01E

INITIAL LISTING: 2006

UPSTREAM LIMIT:

DESCRIPTION: VA-MD State Line

DOWNSTREAM LIMIT:

DESCRIPTION: Mouth

Chesapeake Bay mainstem and its small coastal tidal tributaries

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: PCBs

The Chesapeake Bay and its tidal tributaries are included under the 12/13/2004 VDH Fish Consumption Advisories for PCBs. No more than 2 meals/month are recommended of anadromous (coastal) striped bass.

The advisory was based on the results of DEQ's fish tissue monitoring program, which showed elevated PCBs levels in several monitoring sites within the basin, including:

2 sp at 7-GWR007.97 in the Great Wicomico River
1 sp. At 7-COC000.40 in Cockrell Creek

Also, VDH issued an additional separate fish consumption advisory on 12/13/2004 for PCBs in the Mobjack Bay and its tributaries, particularly the East, West, and Ware Rivers. No more than two meals/month of gizzard shad are recommended.

IMPAIRMENT SOURCE Unknown

Source is considered unknown.

RECOMMENDATION: Problem Characterization

(Attachment C-2) Letter from SWCB to State Department of Health Division of Engineering – February 18, 1975

GHWd → FILE Reedville gen.

Commonwealth of Virginia

STATE WATER CONTROL BOARD

P.O.Box 11143, 2111 N. Hamilton St., Richmond, Va. 23230 (804) 770-1411

Please Reply To: *Tidewater Regional Office*
287 Pembroke Office Park
Suite 310 Pembroke No. 2
Virginia Beach, Virginia 23462
(804) 499-8742

February 18, 1975

SUBJECT: NORTHUMBERLAND COUNTY
Sewerage - Reedville
C-510-500

State Department of Health
Division of Engineering
Madison Building
Richmond, Virginia 23219

Attention: Mr. O. H. Adams, Director

Gentlemen:

In accordance with Section 62.1-44.19, Paragraph 2, of the State Water Control Law, we are advising you of the standards of quality and treatment requirements necessary to prevent contravening such standards of water quality.

The proposed discharge into Cockrell Creek is listed in Section 2 of the standards for the Chesapeake Bay, Atlantic Ocean and Small Coastal Basin and is classified IIB with special standard "a".

STANDARDS

Minimum D. O. : 4.0 mg/l Daily Average D.O.: 5.0 mg/l
pH Range: 6.0-8.5
Maximum Temperature (rise above natural): 4.0 (Sept-May); 1.5 (June-Aug)

Coliform Organisms: The median MPN shall not exceed 70/100 ml., and not more than 10% of samples ordinarily shall exceed an MPN of 230/100 ml. in those portions of the area most probably exposed to fecal contamination during the most unfavorable conditions.

In addition, the shellfish area is not to be so contaminated by radionuclides, pesticides, herbicides or fecal material so that consumption of the shellfish might be hazardous.

STREAM USES - Subclass B

Waters generally satisfactory for use as public or municipal water supply, primary contact recreation, propagation of fish and other aquatic life and other beneficial uses.

Based upon our preliminary investigation, a discharge through submerged diffuser into Cockrell Creek at a point above Haynie Products will provide maximum flushing and dilution. Such a discharge will be adequate to maintain the water quality standards adopted by the Board provided the following effluent parameters are met:

Monthly Average Flow (max): 0.15 MGD
Monthly Average BOD_5 (max): 24 mg/l; 30 lbs/day
Monthly Average Suspended Solids (max): 24 mg/l; 30 lbs/day
Residual Chlorine: 2.0-2.5 mg/l
Minimum Dissolved Oxygen: 6.0 mg/l

These effluent requirements have been included in a draft permit forwarded directly to the Engineer, by copy of this letter.

In addition to meeting the above technical requirements, the following conditions must also be met:

1. The facility must be approved by the County in accordance with State Water Control Law Regulation Number 3. (Copy attached);

2. Owner must apply for a National Pollutant Discharge Elimination System (NPDES) Permit pursuant to Section 402 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). This application must be filed with EPA, Region III with copy to this office. (By copy of this letter, the Engineer has been forwarded a blank application form for completion and subsequent filing).

Upon basic review of treatment requirements and hydraulic capacity of this facility, the staff believes that a Class III Operator is necessary to ensure proper plant operation and maintenance.

If you have any questions, please do not hesitate to contact this office.

Sincerely yours,

D. R. Grubbs, Director
Division of Applied Technology
Tidewater Regional Office

cc: Kilmarnock Office
SWCB - Bureau of Applied Technology (A. E. Pollock)
SWCB - Construction Grants (N. Wayne Burgess)
Cloyde Wiley - Bureau of Shellfish Sanitation
SDH - Bureau of Sanitary Engineering - Attn: L. N. Brown, P.E., Regional Director
Mr. Deward M. Martin, P.E.
Mr. John Burton, Administrator, Northumberland Co., Heathsville, VA. 22473

REEDVILLE

STREAMFLOW = Vel. x Tidal Range x Width

$= .338 \times 2.5 \times 1300 = 1098.5 \text{ cfs} = \underline{710 \text{ MGD}}$

ASSUME 90% SATURATION ⇒ BACKGROUND D.O. = 5.7 mg/l
(ACTUAL MONITORING DATA INDICATES A BACKGROUND D.O. GREATER THAN 90% SATURATION)

$D_o = 6.3 - 5.7 = 0.6 \text{ mg/l}$

* ASSUME 90% EFFICIENCY ⇒ $BOD_w = 20 \text{ mg/l}$

$$L_5 = BOD_m = \frac{BOD_w Q_w + BOD_s Q_s}{Q_w + Q_s}$$

$$= \frac{20(.3) + 2.0(710)}{710.3} = \underline{2.01 \text{ mg/l}}$$

$L_o = L_5 (1.3) = 2.61 \text{ mg/l}$

$$J_d = \left(\frac{K_d}{E}\right)^{1/2} = \left(\frac{.34}{.62}\right)^{1/2} = 0.74 \text{ miles}^{-1}$$

$$J_a = \left(\frac{K_a}{E}\right)^{1/2} = \left(\frac{1.12}{.62}\right)^{1/2} = 1.34 \text{ miles}^{-1}$$

AT $x = 100' = 0.0189$ miles

$L = L_o e^{-J_d x}$

$= 2.61 e^{-.74(.0189)} = \underline{2.57 \text{ mg/l}}$

$$D_x = \frac{K_d L_o}{K_a - K_d}\left(e^{-J_d x} - e^{-J_a x}\right) + D_o e^{-J_a x}$$

$$= \frac{.34(2.61)}{1.12 - .34}(.9862 - .9752) + .6(.9752)$$

$= .0125 + .585 = 0.598 \text{ mg/l} \Rightarrow DO_{stream} = 6.3 - .598 = \underline{5.702 \text{ mg/l}}$

@ $X = 600' = 0.114$ miles

$$L = L_o e^{-K_d x} = 2.61 e^{-.74(.114)} = 2.61(.9911) = 2.59 \text{ mg/l}$$

$$D_x = \frac{K_d L_o}{K_a - K_d}\left(e^{-K_d x} - e^{-K_a x}\right) + D_o e^{-K_a x}$$

$$= \frac{.34(2.61)}{.78}\left(e^{-.08436} - e^{-.1528}\right) + .6e^{-.1528}$$

$$= 1.1377(.061) + .6(.858) = .0694 + .5148 = .584 \text{ mg/l}$$

$$DO_{stream} = 6.3 - .58 = 5.72 \text{ mg/l}$$

@ $X = 1250' = .2367$ miles

$$L = L_o e^{-K_d x} = 2.61 e^{-.74(.2367)} = 2.61(.839) = 2.19 \text{ mg/l}$$

$$D_x = 1.1377\left(e^{-.1752} - e^{-.3172}\right) + .6e^{-.3172}$$

$$= 1.1377(.839 - .728) + .6(.728)$$

$$= 1.1377(.111) + .4368 = .1263 + .4362 = .563 \text{ mg/l}$$

$$DO_{stream} = 6.3 - .56 = 5.74 \text{ mg/l}$$

$X = 50' = .00947$ miles

$$D_x = 1.1377\left(e^{-.74(.00947)} - e^{-1.34(.00947)}\right) + .6e^{-1.34(.00947)}$$

$$= 1.1377(.9930 - .9874) + .6(.9874)$$

$$.00637 + .59244$$

$$= .599 \text{ mg/l}$$

$X = 25' = .00473$ miles

$$D_x = 1.1377\left(e^{-.74(.00473)} - e^{-1.34(.00473)}\right) + .6e^{-1.34(.00473)}$$

$$= 1.1377\left(e^{-.0035} - e^{-.00634}\right) + .6e^{-.00634}$$

$$= 1.1377(.9965 - .9937) + .6(.9937)$$

$$= .00319 + .59622 = .599 \text{ mg/l}$$

$X = 10' = .00189$ miles

$$D_x = 1.1377\left(e^{-.74(.00189)} - e^{-1.34(.00189)}\right) + .6e^{-1.34(.00189)}$$

$$= 1.1377\left(e^{-.0014} - e^{-.00253}\right) + .6e^{.00253}$$

Town of Reedville

Cockrell Creek - Flow

$.338 \times 2.5 \times 1300 = 1098.5$ cfs

1.55 cfs/MGD $\therefore$ 708.71 MGD

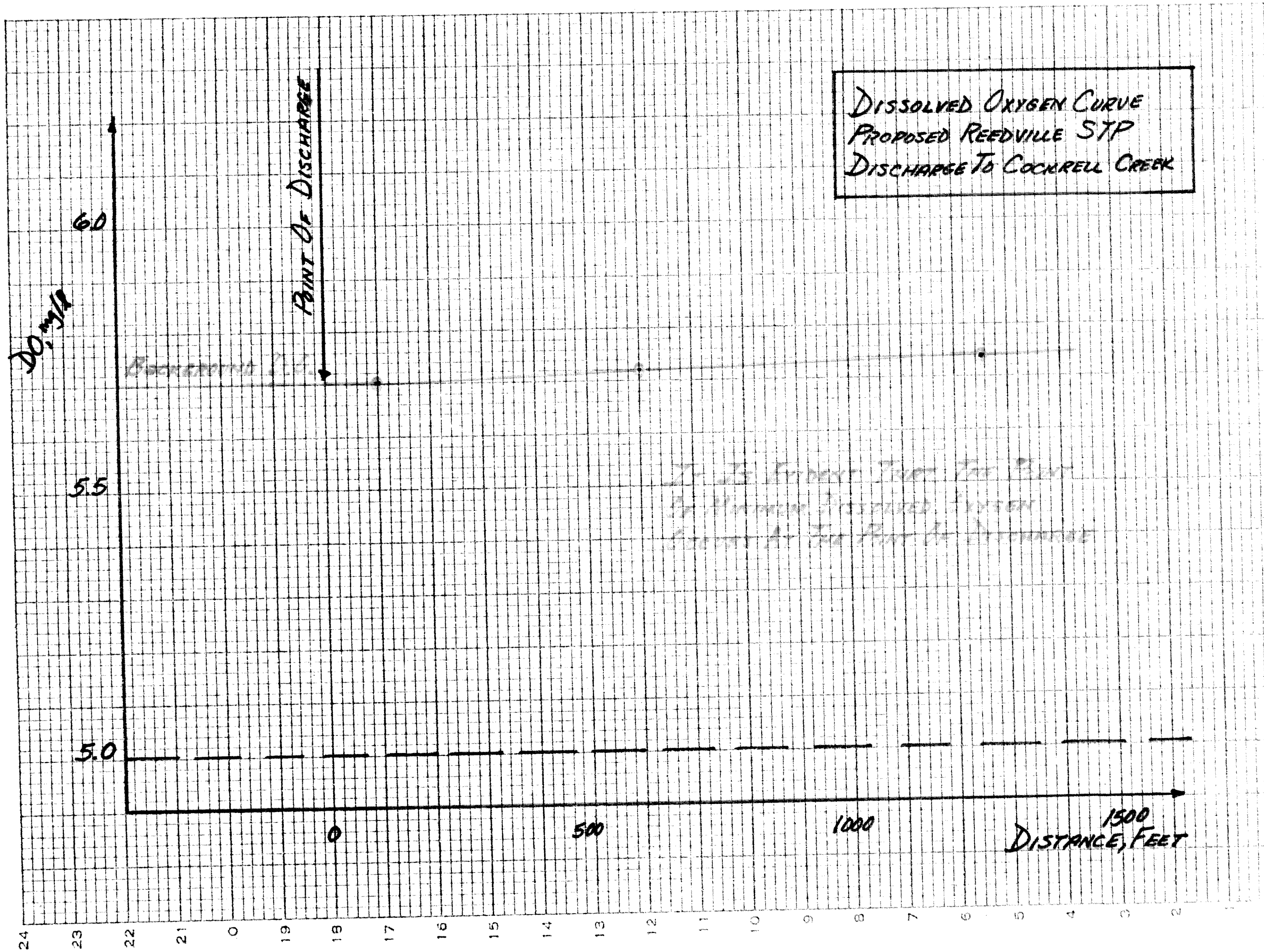
Assume 90% saturation $\Rightarrow$ D.O. $= 5.7$ mg/l

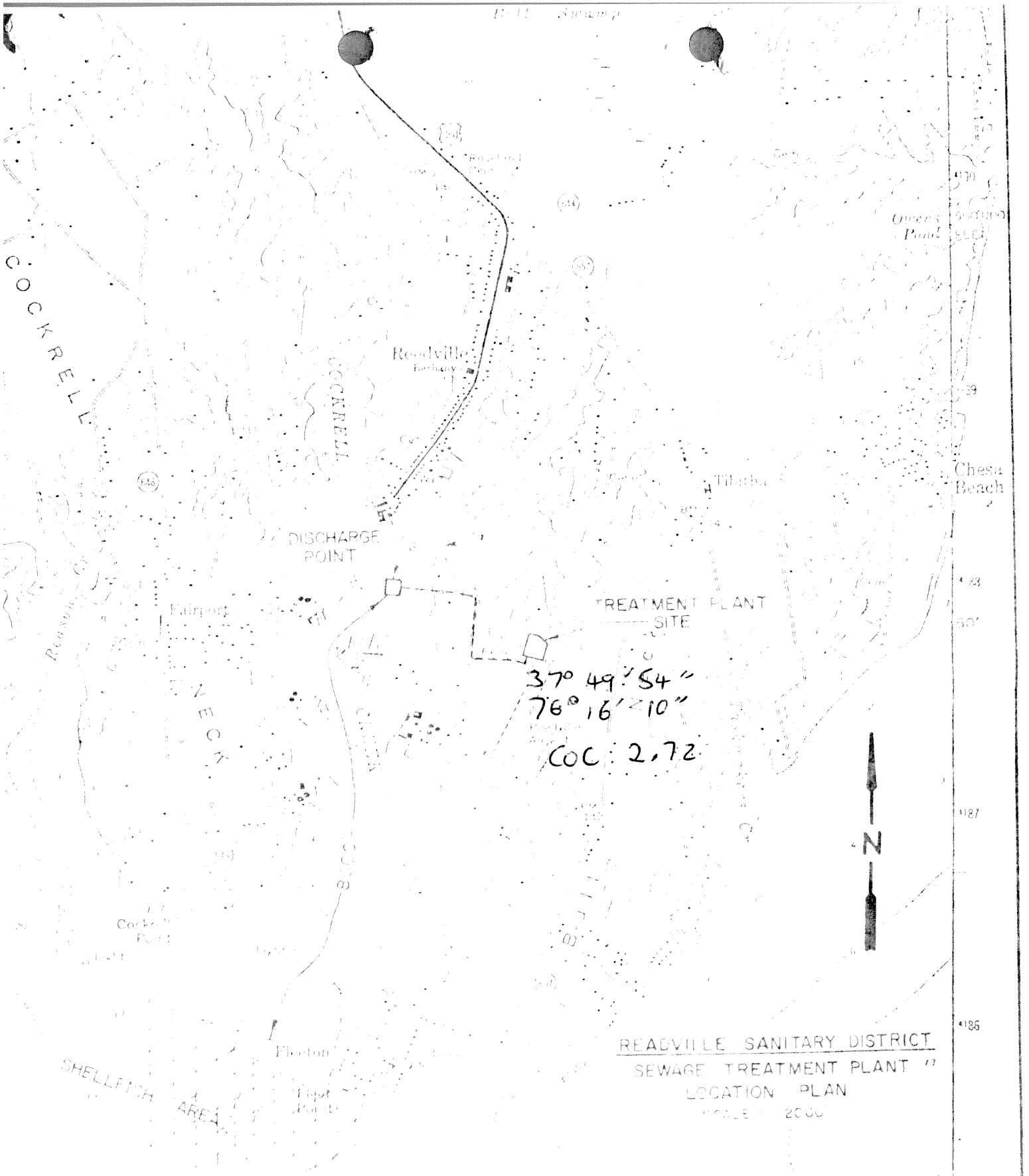
Discharge D.O. $= 2.0$ mg/l $\quad$ 0.2 MGD

$$D.O._{mix} = \frac{2(.2) + 5.7(708.71)}{708.91} = \frac{.4 + 4039.65}{708.91} = \frac{4040.05}{708.91} = 5.70 \text{ mg/l}$$

$$BOD_{mix} = \frac{24(.2) + 2(708.71)}{708.91} = \frac{4.8 + 1417.42}{708.91} = \frac{1422.22}{708.91} = 2.01 \text{ mg/l}$$

$$L_o = 2.01 \times 1.3 = 2.61 \text{ mg/l}$$


Dissolved Oxygen Curve
Proposed Reedville STP
Discharge To Cockrell Creek
DO, mg/l
6.0
5.5
5.0
Point Of Discharge
Background D.O.
It Is Evident That The Point
Of Minimum Dissolved Oxygen
Occurs At The Point Of Discharge
0
500
1000
1500
Distance, Feet



READVILLE SANITARY DISTRICT
SEWAGE TREATMENT PLANT
LOCATION PLAN
SCALE: 1" = 2000'

DEWARD M. MARTIN & ASSOCIATES, INC.
ENGINEERS, PLANNERS & SURVEYORS
P.O. BOX 521, YOAKUM, VIRGINIA 23168

(Attachment C-3) Letter from SWCB to VIMS requesting dye study for Cockrell Creek – April 1, 1975

Commonwealth of Virginia

STATE WATER CONTROL BOARD

P.O.Box 11143, 2111 N. Hamilton St., Richmond, Va. 23230 (804) 770-1411

Please Reply To: *Tidewater Regional Office*
287 Pembroke Office Park
Suite 310 Pembroke No. 2
Virginia Beach, Virginia 23462
(804) 499-8742

April 1, 1975

SUBJECT: TOWN OF REEDVILLE
Proposed Sewage Treatment Plant

Dr. William J. Hargis, Jr.
Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

Dear Dr. Hargis:

As you may know, plans for a sewage treatment facility to serve the Community of Reedville and adjacent areas are under preparation. It is our understanding that the initial design capacity of the plant is 200,000 gpd; final effluent BOD_5 and suspended solids concentrations will be 24 mg/l each with discharge of treated effluent into Cockrell Creek.

The Bureau of Shellfish Sanitation and our office have recently met in an attempt to determine the best point of discharge into Cockrell Creek which would provide adequate assimilation of the treated effluent and, at the same time, provide necessary protection of open shellfish beds outside the mouth of Cockrell Creek. In this regard, it was agreed that the Virginia Institute of Marine Science could best advise us in this matter.

Attachment I shows Cockrell Creek and the general area for discharge (via submerged outfall and diffuser) when considering the probable siting of the treatment plant. This location is shown in Attachment II.

We believe that a dye study is needed to determine time of passage and dispersion characteristics over complete ebb and flood tidal cycles from the designated discharge area (Attachment I.). This information would allow us to properly evaluate the location of the plant outfall in regard to possible effects on shellfish beds beyond the mouth of Cockrell Creek. This has been discussed via telephone with your Dr.Fang and he indicated that VIMS could possibly assist us in this effort. We would appreciate any comments or guidance that you might be able to give us concerning the effect of the proposed discharge on water quality in Cockrell Creek.

I believe that this problem provides an excellent opportunity to demonstrate inter-agency cooperation and hope that you look upon this request favorably. In order for us to provide timely review of this problem, we would need results from your study in a 4-6 week period.

Mr. Wiley, Director of the Bureau of Shellfish Sanitation, and Mr. Grubbs, my Director of Applied Technology, will be available to provide your staff with any additional information regarding shellfish considerations and proposed treatment efficiencies for the Reedville Plant, respectively. If you have any questions concerning our request, please let me know.

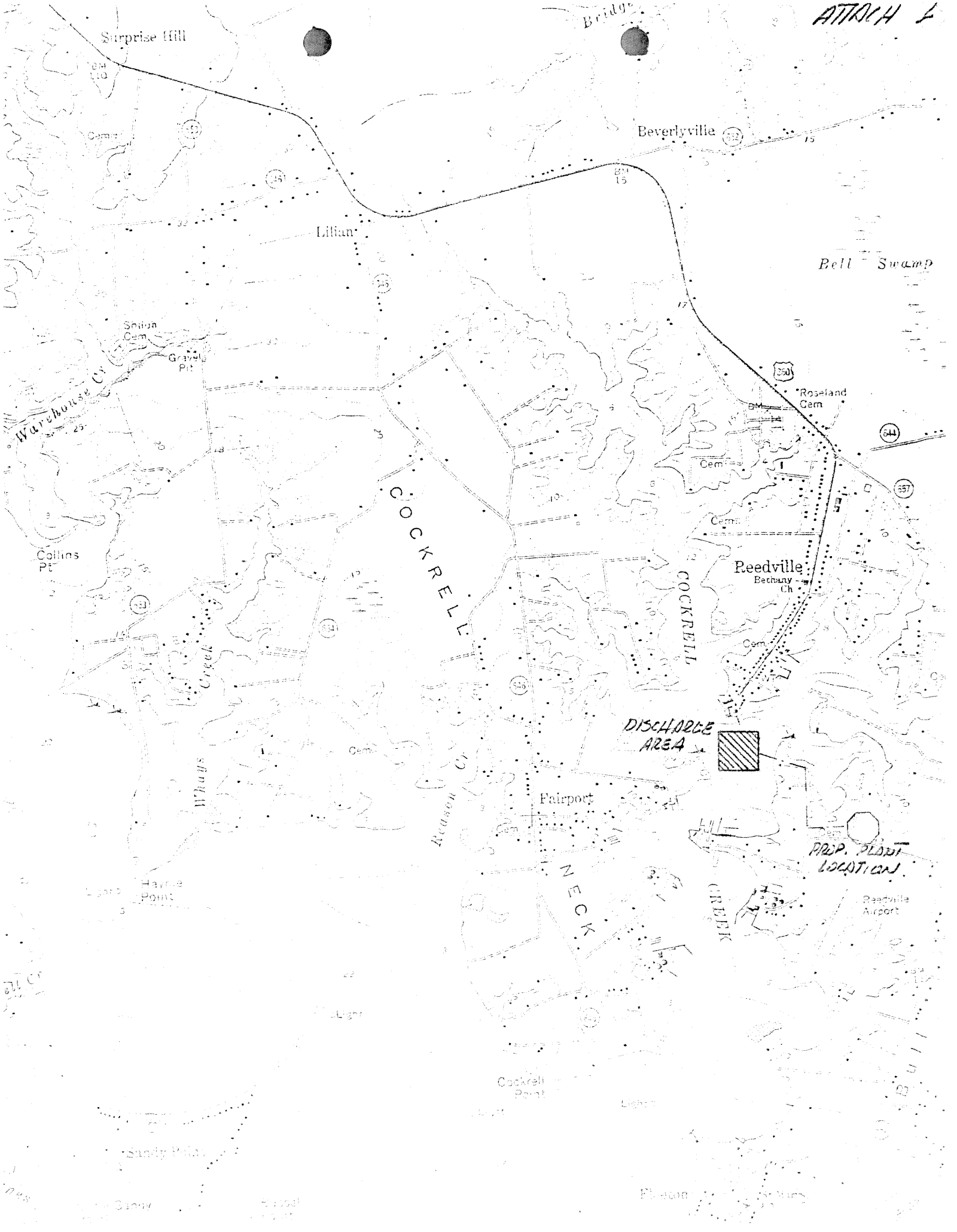
Very truly yours,

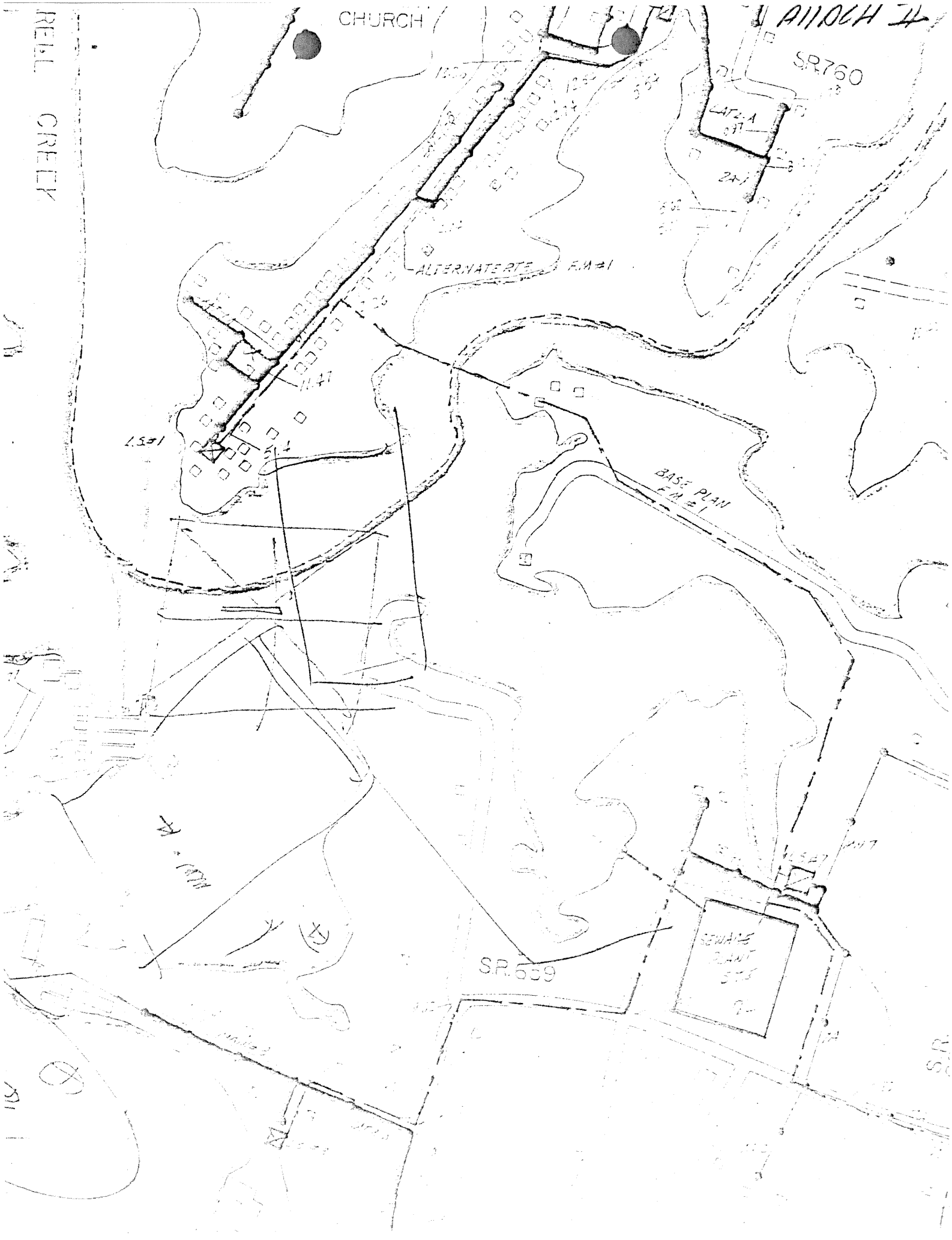
L. S. McBride

L. S. McBride, Director
Tidewater Regional Office

dak

cc: SWCB - TRO - D. R. Grubbs
Richmond - BAT
Kilmarnock - G. T. Yagel
Construction Grants - N. W. Burgess
SWCB - A. H. Paessler
SDH - Bureau of Sanitary Engineering - Richmond
SDH - Bureau of Shellfish Sanitation - C. W. Wiley
Mr. Deward M. Martin, P.E.
Mr. John Burton - Northumberland County Administrator


ATTACH 2
Surprise Hill
Beverlyville
Lillian
Bell Swamp
Smith Cem
Gravel Pit
Warehouse Cr
Roseland Cem
Cem
COCKRELL
Collins Pt
Reedville
Bethany Ch
COCKRELL
Creek
DISCHARGE AREA
Wrays
Fairport
Reason Cr
PROP. PLANT LOCATION
Hayne Point
NECK
CREEK
Reedville Airport
Cockrell Point
Light
Sandy Point
Pleasant


REEL CREEK
CHURCH
SR760
ALTERNATE RTE
BASE PLAN
SR.609
SEWAGE PLANT

STREAM DATA

1. Estimated Minimum Daily Flow TIDAL (~~2.2 cfs~~ 338 cfs) Duration mean 7 consecutive day drought

   Frequency 10-year

2. Stream - Free Flowing (✓) Sluggish ( )

3. Distance Downstream to Nearest Community 0.95 miles (Fleeton)

4. Distance Downstream to Nearest Water Intake N/A

5. Name of Receiving Stream COCKRELL CREEK

6. Is Shellfish Growing a Consideration (✓)Yes ( )No
   If "Yes", what provisions have been made? AREA PREVIOUSLY CONDEMNED (See Attached Map)

7. Are any units subject to flooding? ( )Yes (✓)No Flood Elev. 9.0 feet
   Frequency 100 year If "Yes", what is the risk and what reasonable protection has been provided?

8. Stream Classification SECTION 2 - CLASS II B (a)

9. Water Quality Criteria Daily Ave. D.O. = 5.0 mg/l, Special Standard "a" regarding coliform organisms

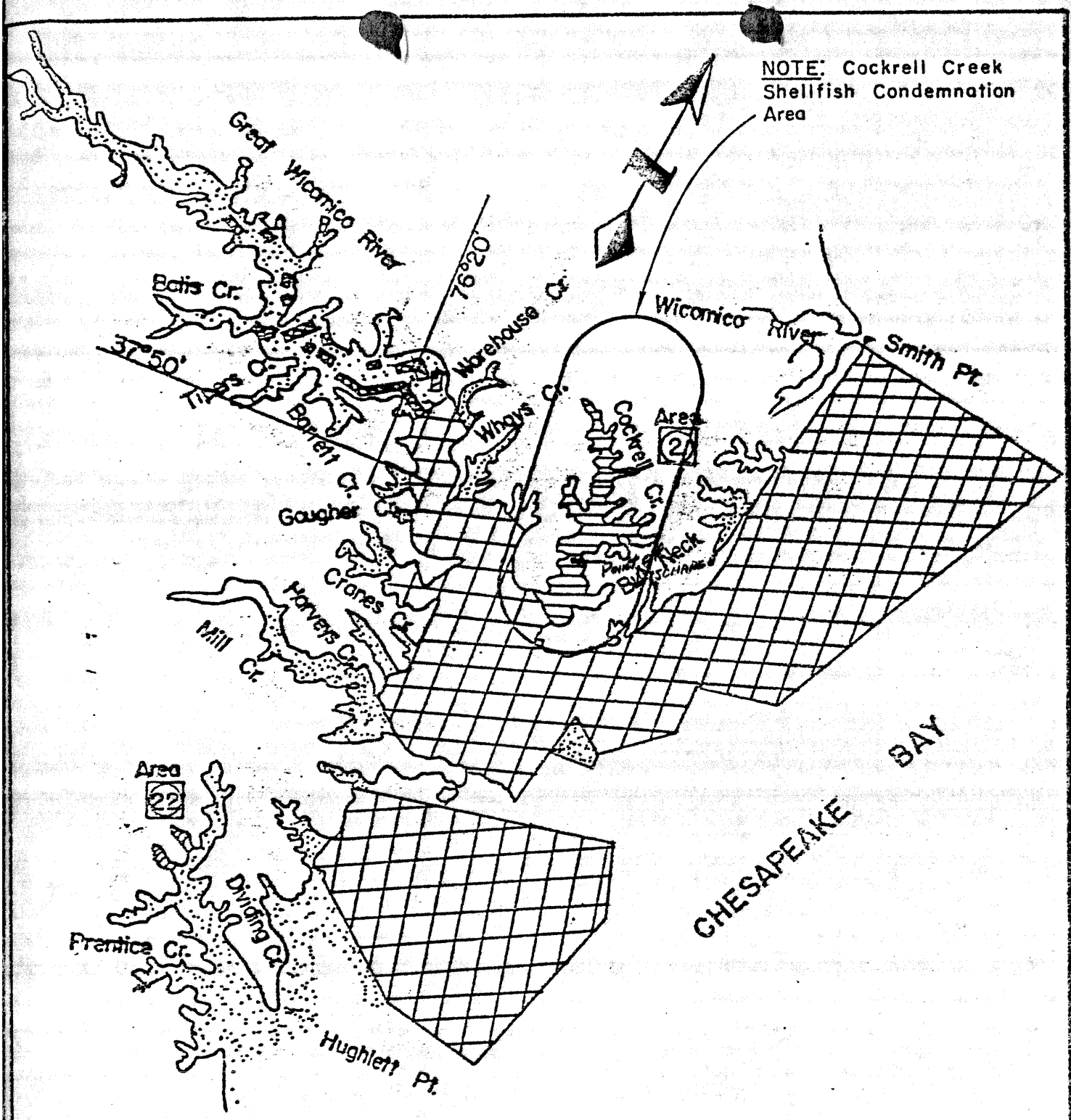
10. Are Permits to Construct required from other Federal Agencies? (✓)Yes (~~✓~~)No
    (Attach sanitary analysis of stream)

COMPONENT RELIABILITY

(Refer to EPA Manual entitled "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability)

Reliability Class

Yes	No	Reliability
___	___	Is standby power provided? If standby power is not provided, describe the means of assuring continuous operation on an attachment.
___	___	Is the works provided with a controlled diversion?
___	___	Have multiple units and equipment been provided to the maximum extent possible?
___	___	Have retention basins been provided (Relibility Class I)
___	___	Can individual plant units be bypassed?
___	___	Have adequate component drains been provided?
___	___	Are there adequate provisions for flexibility of operation?
___	___	Has consideration been given to protection from floods?
✓	___	Is treatment process suitable for the character and volume of the sewage to be treated?



1 ½ 0 1 2 3 Miles

NAUTICAL MILES

MAP PREPARED BY
VIRGINIA STATE WATER CONTROL BOARD
REPRODUCED BY
D.M.MARTIN & ASSOCIATES
WILLIAMSBURG, VIRGINIA

FIGURE 2CB

CHESAPEAKE BAY

LOCATION OF OYSTER BEDS

PRELIMINARY REPORT
REEDVILLE AREA---
SEWAGE WORKS PROJECT
SHELLFISH AREAS
NORTHUMBERLAND COUNTY VIRGINIA

(Attachment C-4) Memorandum by G.T. Yagel
August 15, 1979

FKC
Reedville Fact Sheet
Attachment #5

4010 WEST F[illegible]AD S[illegible]T State Water [illegible]ont Board
P. O. Box 11143
RICHMOND, VA.

SUBJECT: Menhaden Industries Permit Reissuance - Cockrell Creek Wasteload Allocation - Northumberland County

TO: File - Kilmarnock Office

FROM: G. T. Yagel

DATE: August 15, 1979

COPIES: L. S. McBride, L. G. Lawson, A. J. Anthony, J. R. Bell, F. K. Cunningham, Dale F. Jones, Burton R. Tuxford

In anticipation of this division's responsibilities for the reissuance of permits for two menhaden industries in Northumberland County, the issue of wasteload allocation for $CBOD_5$ has been under consideration for more than a year. The deadline date for the reissuance is January 1980. No attempt will be made to include in this memorandum a summary of all of the items brought forth in many conferences with VIMS, the permittee consultants, and other staff members. That information can be found in our regional office file. The purpose of this memorandum is to set forth conclusions reached during a conference with personnel of BAT, BWCM, BE, and TRO-DSP on August 7, 1979 at 10:30 a.m. Personnel involved are listed below:

A. J. Anthony	- BAT
J. R. Bell	- BAT
Dale F. Jones	- BWCM
Burton R. Tuxford	- BWCM
Anne Field	- BE
G. T. Yagel	- TRO-DSP

1. VIMS model of Cockrell Creek has been verified and will be utilized as the basis for wasteload allocation of the total loading from these menhaden industries during the drafting of limitations for reissued permits.

2. In accordance with the VIMS model, 5,000 pounds per day of carbonaceous BOD is the total limit allowable for all discharges into Cockrell Creek in order that 5.0 m/l of DO will be maintained in the upper layer of that receiving stream. 100 pounds per day of that total will be reserved for the Reedville Sanitary District sewage treatment facilities in order that growth may be allowed, leaving the industries with 4,900 pounds per day.

3. The 4,900 pounds total loading is considered a daily average and not a daily maximum.

4. The upper layer of Cockrell Creek, as identified in the VIMS model will be used to determine wasteload allocation which is agreed to by BWCM.

5. Suspended Solids loading will be reduced in the reissued permits by the same proportion as the $CBOD_5$.

6. Net loading methodology used in the past for calculating daily loading from each industry will be deleted.

7. Alteration of the water quality standards now applicable to Cockrell Creek can only be accomplished in accordance with Section 35.1550 appearing in the Federal Register/Volume 44 No.101/Wednesday, May 23, 1979. It was Anne Field's opinion that relaxation of existing standards could be accomplished only if economic data, provided by each industry, demonstrated that compliance with wasteload allocations planned would necessitate termination of the operations of these industries.

8. After considering all alternatives for allocation methodology, it was decided that productivity capability of each industry would be used as the basis for determining the percentage of allowable loading of waste to be allocated to each industry during the drafting of permit limits for permit reissuance. TRO-DSP personnel will confer with the management of each industry on August 20, 1979 for the purpose of explaining the allocation methodology agreed upon in securing production capacity data.

9. In response to F. K. Cunningham and G. T. Yagel's memorandum to Dale Jones, dated August 6, 1979, comments from Dale Phillips regarding the approach planned for wasteload allocation and the use of the VIMS model are expected prior to August 20, 1979.

The writer is anticipating that at least one of these industries may be requesting a hearing before the Board after they receive notice of the allocation offered them, for the purpose of contesting our decision in accordance with the provisions of Regulation #6 and the current NPDES Permit Issuance Manual. During that hearing, economic data may be provided by each or both of these industries. That data probably should include dollar value of the final product exported from each of these plants to their markets, other socio-economic factors, which only the industries can provide, number of employees affected by possible termination of production, and production data for the 1973-1974 seasons as compared to that data available for the 1977-1978 production seasons.

/bj

(Attachment C-5) Memorandum by Jon von Soestbergen
September 17, 1998

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Water Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296 804/527-5020

SUBJECT: **Cockrell's Creek Wasteload Allocations and Dilution Analysis**
Zapata Protein (USA), Inc. Discharge (VA0003867)

TO: **Denise Mosca**

FROM: **Jon van Soestbergen**

DATE: **September 17, 1998**

COPIES: **Dale Phillips, Curt Linderman**

Per your request, I have reviewed the BOD wasteload allocations for the subject discharge to Cockrell's Creek. I also constructed a CORMIX model to analyze dilution ratios at the discharge associated with different diffuser designs. Two discharges (Ampro Fisheries and Zapata Protein) previously competed for the available assimilative capacity of the receiving stream, and previous models and analyses simulated both discharges to allocate wasteloads. However, the Ampro discharge was terminated. The purpose of this review was to determine if the BOD wasteload previously allocated to Ampro was available in part, or in total, to Zapata. The CORMIX analysis of a diffuser for outfall number 002 was performed to determine the dilution ratio for establishing wasteload allocations for conservative parameters.

BOD Wasteload Allocation Review

In September 1976, the Virginia Institute of Marine Sciences (VIMS) completed a mathematical water quality study of the Great Wicomico River and Cockrell's Creek. The model determined that an average of 5,000 lbs/day of BOD_5 would maintain water quality standards in the upper layer of the creek, which was the only layer used to determine the pollutant loading to the creek. Of this total, 4,900 lbs/day would be allocated to Ampro (then known as Standard Products) and Zapata.

My review of the available information leads me to conclude that the total allowable loading to Cockrell's Creek is 5,000 lbs/day of BOD_5, regardless of the point of discharge. Therefore, with the termination of the Ampro discharge, the entire 4,900 lbs/day previously allocated to the two discharges is available for allocation to Zapata.

CORMIX Diffuser Analysis

Zapata currently proposes to discharge through a total of four outfalls to Cockrell's Creek, but only outfall 002 was considered for a diffuser. The proposed discharge flow from this outfall is 0.300 mgd. The complex design of the diffuser included with the permit fact sheet can not be accurately analyzed using the CORMIX model. However, by simplifying the design somewhat, the expected dilution the diffuser will provide could be estimated. In addition to analyzing the design of this diffuser, a modified design was analyzed which affords better dilution in the near field.

Two diffuser designs were analyzed; one which closely approximates the design included in the fact sheet ("short diffuser") and one which affords better dilution ("long diffuser"). For each case, dilution was analyzed relative to one-hour averages under critical conditions, which most closely approximates the way the acute standards are written.

"Short Diffuser" - This diffuser design consists of a 12-inch diameter pipe extending 35 feet perpendicular to the east bank of the creek into water of approximately 5 foot depth. The diffuser line (the part with holes) starts 15 feet from the shore and extends to the end of the diffuser (20 feet). There are 13 holes of 4 inch diameter in the top of the pipe, and the end is blocked such that all flow is directed upward through the diffuser ports (holes). A rough sketch of the diffuser is attached.

This "short diffuser" design results in a dilution of 50:1 at the boundary of the mixing zone. This dilution ratio should be used to determine both acute and chronic WLAs for the discharge. The associated mixing zone boundary is 7.62 meters (25 feet) measured in a circle from the diffuser midpoint.

"Long Diffuser" - This diffuser consists of a 12-inch diameter pipe extending 60 feet perpendicular to the east bank of the creek, also into water of approximately 5 foot depth. The diffuser line starts 20 feet from shore and extends to the end of the diffuser (40 feet). There are 8 holes of 4 inch diameter, located such that flow will be directed in a 45 degree angle toward the water surface in the downstream direction during ebb tide. Again, the end of the pipe is closed so that all flow discharges through the diffuser ports. A rough sketch of the diffuser is attached.

This "long diffuser" design results in a dilution of 100:1 at the boundary of the mixing zone. This dilution should be used for both the acute and chronic WLAs for the discharge. The associated mixing zone boundary is 6.10 meters (20 feet) measured in a circle from the diffuser midpoint.

Conclusions and Recommendation

The BOD_5 wasteload available to Zapata Protein is 4,900 lbs/day.

If the "short diffuser" is specified, a dilution ratio of 50:1 should be used. For the "long diffuser", the dilution ratio can be increased to 100:1. This shows that different diffuser designs can result in dramatically different dilution ratios, and thus need to be taken into consideration when establishing wasteload allocations and permit limits. As such, it is important that the diffuser design be specified for a wasteload allocation based on a given dilution ratio. It is recommended that the alternate diffuser designs be presented to the permittee so that the advantages of each design can be considered. The designs presented should serve only as preliminary designs. The sketches provided herewith should in no way be construed as final diffuser designs. Alternate designs not yet considered are also possible, and can be submitted by the permittee for subsequent analysis using CORMIX.

Pertinent documentation for the CORMIX analysis is included herewith. Should you have any questions or need additional information, please do not hesitate to contact me.

Attachment:

Notes and Model Runs - Zapata Cormix Diffuser Analysis - Cockrell's Creek, 09/16/1998, 24 pages

(Attachment C-6) Stream Sanitation Analysis by Jennifer Palmore – December 19, 2003

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Water Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296 804/527-5020

SUBJECT: **Stream Sanitation Analysis – Cockrell Creek**
Town of Reedville STP (VA0060712)

TO: **Denise Mosca**

FROM: **Jennifer Palmore**

DATE: **December 19, 2003**

COPIES: **Curt Linderman, Mark Alling, VA0060712 Model File**

A request for a stream sanitation analysis for Town of Reedville STP was received on November 18, 2003. The discharge is located on Cockrell Creek, a tributary to the Great Wicomico River, at river mile 7-COC001.41. The plant is currently permitted at a design flow of 0.04MGD, and the town has requested a plant expansion up to a design flow of 0.2 MGD.

Background

The Virginia Institute of Marine Science (VIMS) modeled Cockrell Creek in 1976. The model determined that a daily average of 5,000 lbs./day carbonaceous BOD_5 would maintain the water quality standard of 5 mg/L dissolved oxygen in the upper level of the creek, which was the only layer used to determine the pollutant loading (J. van Soestbergen, 1998). This loading was divided between the two menhaden processing facilities in existence at that time and the Town of Reedville STP. It was decided that 4,900 lbs./day would be allocated to the menhaden facilities and 100 lbs./day would be allocated for the "Reedville Sanitary District sewage treatment facilities in order that growth may be allowed" (Yagel, 1979).

Recommendations

When the plant is expanded, the permit should contain a 100 lbs./day average $cBOD_5$ loading in order to maintain water quality standards. Technology-based concentration limits are appropriate as long as the loading limit is not exceeded. The 1979 memo indicates that the total suspended solids were to be reduced in the same proportion as the $cBOD_5$, if that is necessary. Since the loading is believed to maintain, but not exceed, the water quality standard, the creek is determined to be a Tier 1 water and the antidegradation policy is not applicable.

If you have any questions or need any additional information, please do not hesitate to contact me.

(Attachment C-7) Cormix Modeling Memorandum by Allan Brockenbrough – December 31, 2003

COMMONWEALTH OF VIRGINIA
Department of Environmental Quality
Office of Water Permit Programs

Subject: **CORMIX Modeling of the Town of Reedville WWTP Outfall – VA0060712**

To: **Denise Mosca, KSO**

From: **Allan Brockenbrough, OWPP** ABB

Date: **December 31, 2003**

Copies: **Jennifer Palmore, PRO**

In response to your recent request, I have used the CORMIX model to estimate appropriate acute and chronic dilution factors for the Reedville WWTP at a design flow of 0.2 MGD. The facility has previously been permitted at an actual flow of 40,000 gpd.

DEQ staff have generally limited acute and chronic wasteload allocations to the amount of near field mixing predicted by the CORMIX model. This was the approach used in 1998 to generate a mixing ratio of approximately 160:1 for the 40,000 gpd discharge. An alternative approach has been to limit the allocated impact zone (acute allocation) to the spatial restrictions included in EPA's Technical Support Document for Water Quality-based Toxics Control. In 2003 the State Water Control Board approved modifications to the Commonwealth's Water Quality Standards limiting mixing zones in tidal waters to 5 times the average depth along a line extending 1/3 of the way across the receiving water from the discharge point to the opposite shore. This modification to the Water Quality Standards has not taken affect as of the date of this memorandum.

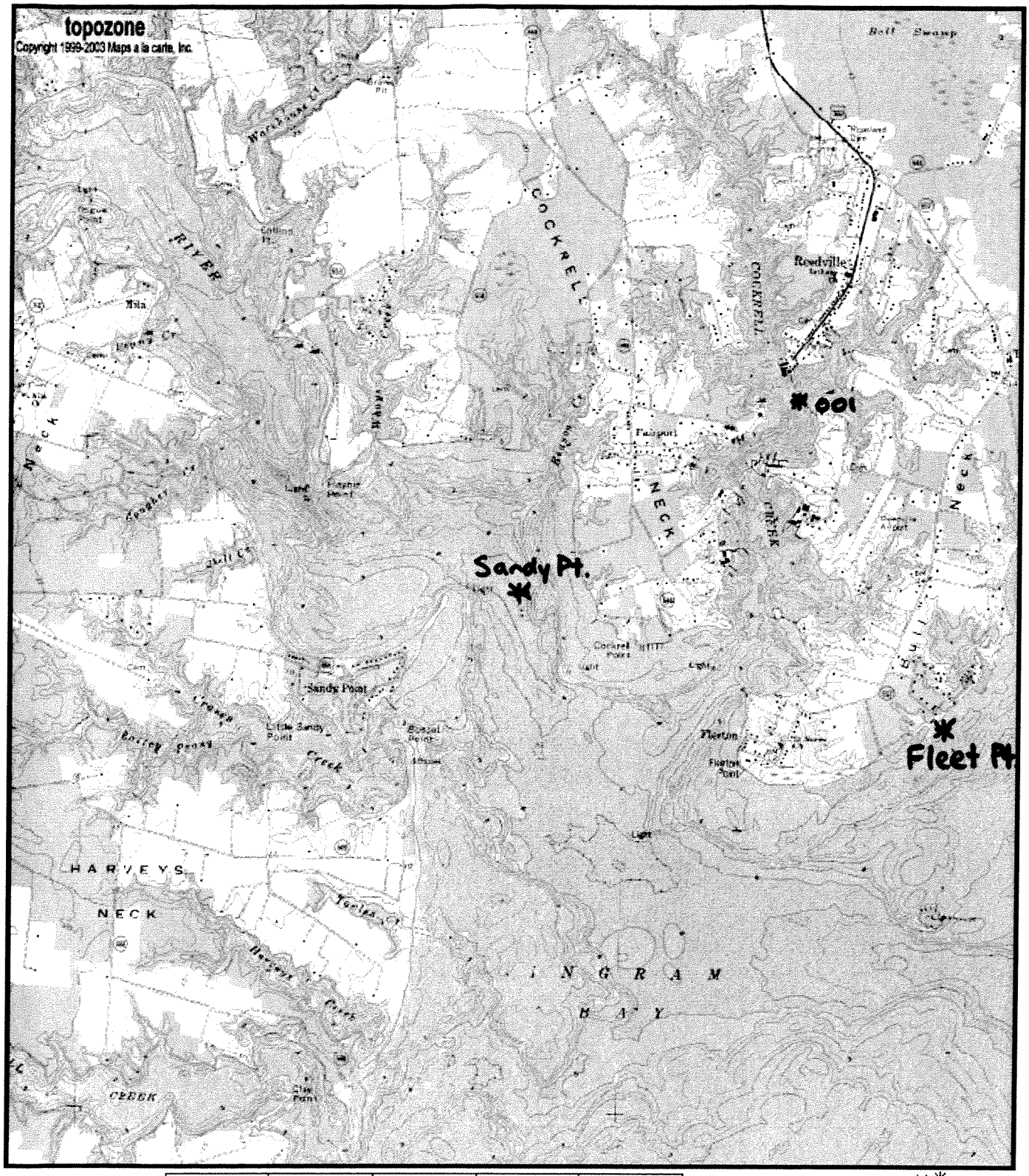
I have evaluated the discharge using all of the criteria in the previous paragraph and they all yield similar results. Based on the modeling results I recommend an acute WLA multiplier of 6.0 (5 parts Cockrell Creek water and 1 part effluent) and a chronic WLA multiplier of 14.3. The acute mixing ratio of 6.0 represents the average mixing over one hour following low water slack tide. The chronic mixing ratio of 14.3 represents the average near field mixing over seven tidal conditions as outlined in the CORMIX User's Manual (Jirka, et al, September 1996). In addition to the discharge flow, two other changes to the 1998 CORMIX inputs resulted in reduced mixing predictions: (1) a reduction in current velocities based on the nearest NOAA station at Sandy Point, 1.29 nautical miles from the outfall, and (2) correction of the port diameter to 8 inches.

Please give me a call if we need to discuss further.

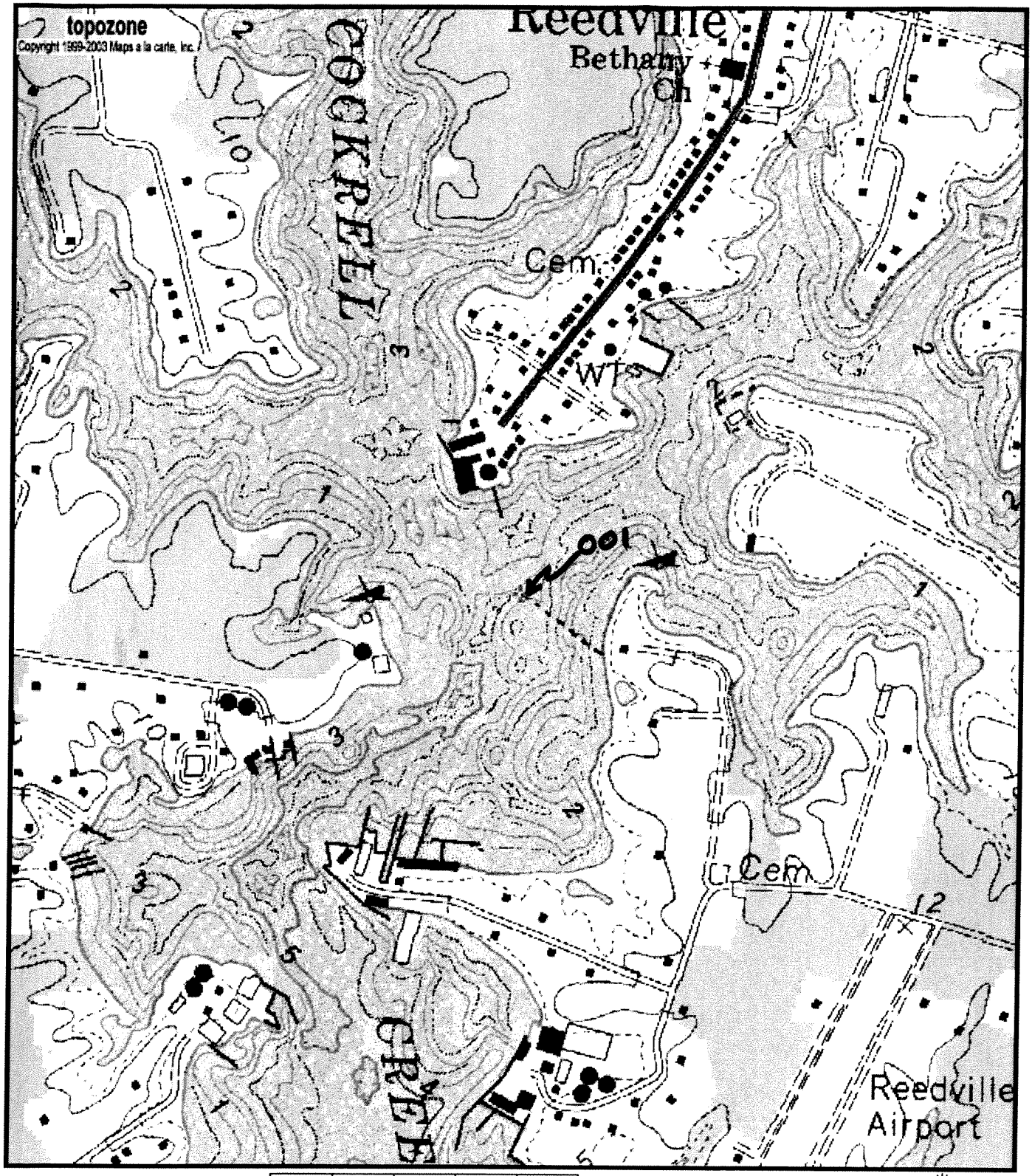
Attachment 1
Tide and Current Data

Closest Tide and Current Stations to: **Custom Location**
Lat 37° 50.08' N Lon 076° 16.70' W
(All tide regions searched, within 10 Nm; All current regions searched, within 10 Nm)

	Type	Location	Distance	Bearing	Latitude	Longitude	Region
1	Tide	Fleet Point	1.21 Nm	152.9°	37°49' N	076°16' W	Mid Atlantic (NOAA)
2	Current	Sandy Point, east of	1.29 Nm	232.8°	37°49.30' N	076°18.00' W	Mid Atlantic (NOAA)
3	Tide	Great Wicomico River Light	2.15 Nm	165.1°	37°48' N	076°16' W	Mid Atlantic (NOAA)
4	Tide	Sunnybank, Little Wicomico River	2.97 Nm	10.7°	37°53' N	076°16' W	Mid Atlantic (NOAA)
5	Tide	Glebe Point, Great Wicomico River	4.29 Nm	282.4°	37°51' N	076°22' W	Mid Atlantic (NOAA)
6	Current	Smith Point Light, 0.8 n.mi. NW of (8d)	4.93 Nm	50.3°	37°53.23' N	076°11.90' W	Mid Atlantic (NOAA)
7	Current	Great Wicomico R. Lt., 3.8 n.mi. ESE of (14d)	5.13 Nm	126.9°	37°47.00' N	076°11.50' W	Mid Atlantic (NOAA)
8	Tide	Smith Point Light	5.36 Nm	57.0°	37°53' N	076°11' W	Mid Atlantic (NOAA)
9	Tide	Dividing Creek	6.17 Nm	189.6°	37°44' N	076°18' W	Mid Atlantic (NOAA)
10	Current	Smith Point Light, 1.5 n.mi. east of (14d)	6.55 Nm	66.0°	37°52.75' N	076°09.12' W	Mid Atlantic (NOAA)
11	Current	Smith Point Light, 3.0 n.mi. east of (15d)	8.02 Nm	71.3°	37°52.65' N	076°07.08' W	Mid Atlantic (NOAA)
12	Current	Tangier Sound Light, 5.8 n.mi. west of (15d)	9.23 Nm	109.3°	37°47.03' N	076°05.68' W	Mid Atlantic (NOAA)
13	Current	Smith Point Light, 4.5 n.mi. east of (14d)	9.37 Nm	73.9°	37°52.67' N	076°05.30' W	Mid Atlantic (NOAA)
14	Current	Point Lookout, 5.2 n.mi. SW of (13d)	9.67 Nm	326.3°	37°58.12' N	076°23.50' W	Mid Atlantic (NOAA)
15	Current	Smith Point Light, 6 miles north of	9.76 Nm	25.4°	37°58.90' N	076°11.40' W	Mid Atlantic (NOAA)



Map center is 37° 49' 28"N, 76° 18' 00"W (WGS84/NAD83)
Reedville quadrangle - TopoZone Pro elevation display
Projection is UTM Zone 18 NAD83 Datum



Map center is 37° 50' 11"N, 76° 16' 43"W (WGS84/NAD83)
Reedville quadrangle - TopoZone Pro elevation display
Projection is UTM Zone 18 NAD83 Datum

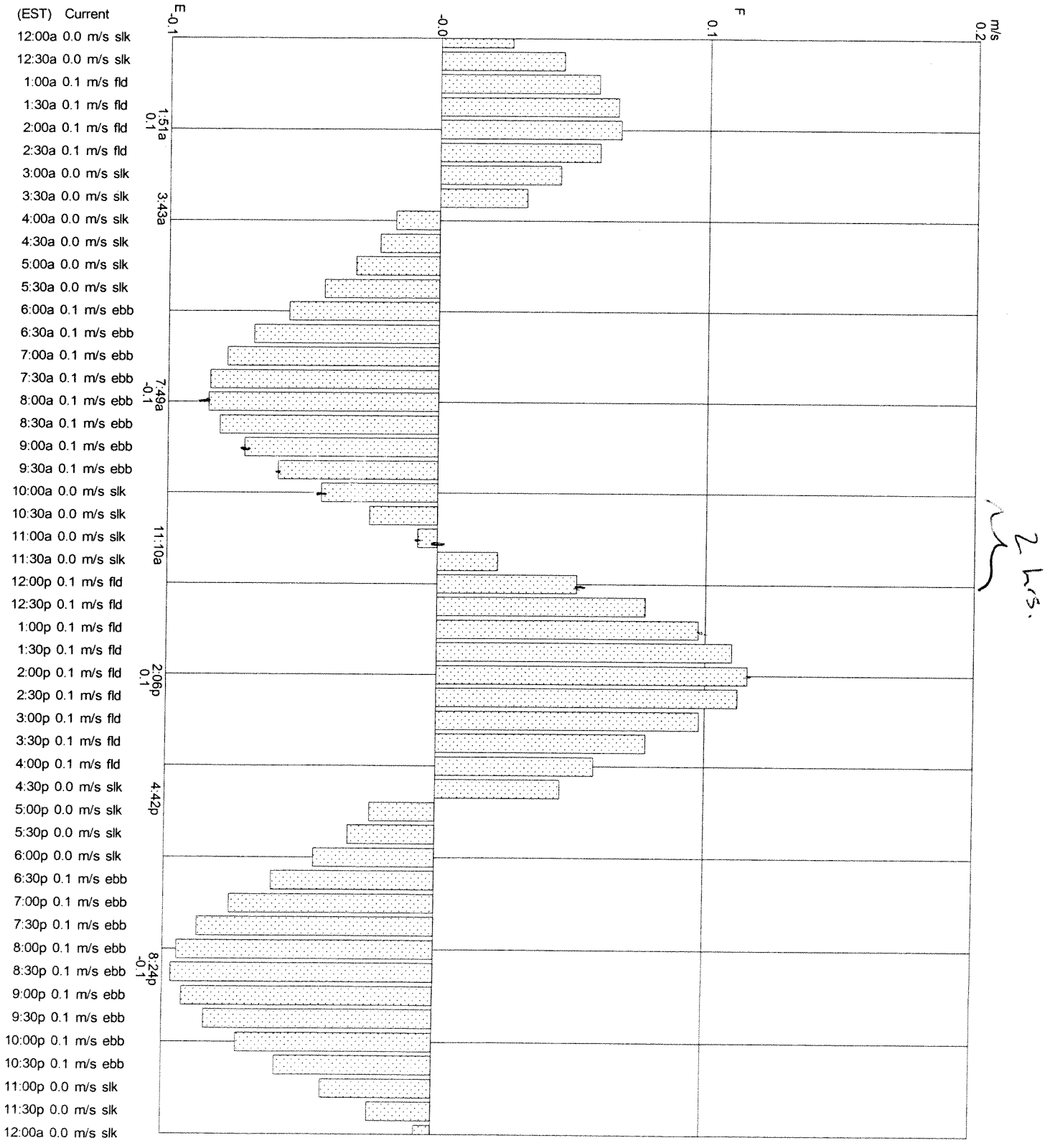
Currents-Sandy Point, east of

based on C40 - Chesapeake Bay Entrance (NOAA)
37° 49.30 N 76° 18 W

Saturday, November 24, 1990

Average Currents
Min Before Flood: - - - -
Avg Max Flood: 0.2 m/s 320°
Min Before Ebb: - - - -
Avg Max Ebb: 0.2 m/s 140°

Slack	Max Flood & Ebb	
	1:51a	0.1 m/s 320° fld
3:43a	7:49a	0.1 m/s 140° ebb
11:10a	2:06p	0.1 m/s 320° fld
4:42p	8:24p	0.1 m/s 140° ebb



2 hrs.

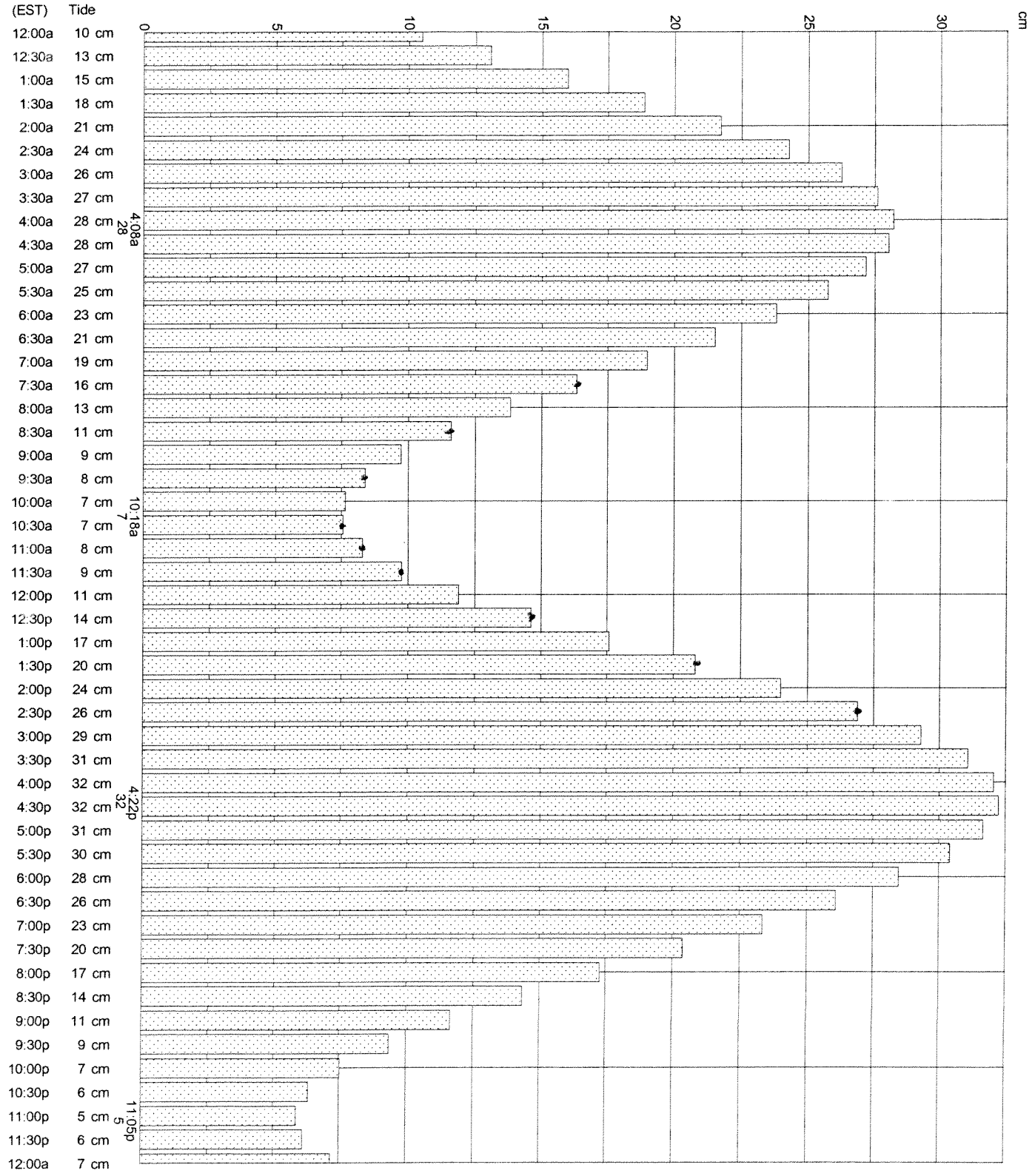
Tides-Fleet Point

based on Hampton Roads, Virginia (NOAA)
37° 49 N 76° 16 W

Saturday, November 24, 1990

Average Tides	
Mean Range:	33 cm
MHWS	39 cm
Mean Tide:	18 cm

Daily Highs & Lows		
4:08a	28 cm	High
10:18a	7 cm	Low
4:22p	32 cm	High
11:05p	5 cm	Low



Attachment 2
CORMIX Prediction Files

Discharger: Reedville WWTP (0.2 MGD)

Tidal Condition		Current Velocity (m/s)	Depth above MLW (m)	50X Discharge Length Scale	Near Field Dilution	Near Field Distance (m)
a	LWS(*)	0	0	3.4	3.4	2.2
b	LWS + 1 hr.	0.05	0.03	11.8	9.8	3.6
c	LWS + 2 hr.	0.1	0.11	26.5	23.8	6.4
d	Max. Flood Velocity	0.12	0.17	31	29.4	7.9
e	HWS(*)	0	0.27	3.9	3.9	2.3
f	HWS + 1 hr.	0.03	0.21	8.1	6.9	4.3
g	HWS + 2 hr.	0.08	0.17	25	22.8	6.8

Port Diameter = 8"
50 X Discharge Length Scale = 9 m
5X local water depth = 9.1 m

Min 1-hr. Dilution (Acute WLA)	Tidal Avg. Dilution (Chronic WLA)
6.0	14.3

(*) CORMIX truncated prior to reaching 9 m

```
CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                           CORMIX-GI Version 4.2GT
                        HYDRO1 Version 4.2 August 2002
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:    Reedville WWTP
 Design case:        LWS
 FILE NAME:          D:\Cormix\MyFiles\Reedville\Reedville a.prd
 Time stamp:         Wed Dec 31 09:45:33 2003

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    483.00  AS    =    883.31  QA    =      0.10  ICHREG= 1
 HA    =      1.83  HD    =      1.83
 UA    =     0.000  F     =     0.314 USTAR =0.2244E-04
 UW    =     2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  999.7000

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT       DISTB =    161.54
 D0    =     0.203  A0    =     0.032 H0    =      0.10
 THETA =      0.00  SIGMA =    270.00
 U0    =     0.270  Q0    =     0.009       =0.8763E-02
 RHO0  =  996.3187  DRHO0 =0.3381E+01  GP0   =0.3317E-01
 C0    =0.1000E+04  CUNITS=  ppb
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES (metric units)
 Q0    =0.8763E-02  M0    =0.2365E-02  J0    =0.2906E-03  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =      0.18  LM    =      0.63  Lm    =    429.59  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =      3.29  R     =   2384.36

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =   H4-90A41
 1  Applicable layer depth HS =     1.83  1
 11111111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+04  CUNITS=  ppb
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   6000.00  XMAX  =   6000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
       161.54 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 10 display intervals per module
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE

 COANDA ATTACHMENT immediately following the discharge.
```

```
       X         Y         Z         S         C         B
    0.00      0.00      0.00       1.0 0.100E+04    0.14

END OF MOD101: DISCHARGE MODULE
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.
 Bottom-attached jet motion.

 Profile definitions:
   B = Gaussian 1/e (37%) half-width, normal to trajectory
           Half wall jet, attached to bottom.
   S = hydrodynamic centerline dilution
   C = centerline concentration (includes reaction effects, if any)

       X         Y         Z         S         C         B
    0.00      0.00      0.00       1.0 0.100E+04    0.10
    0.00     -0.09      0.00       1.0 0.100E+04    0.11
    0.00     -0.18      0.00       1.0 0.100E+04    0.12
    0.00     -0.28      0.00       1.0 0.100E+04    0.13
    0.00     -0.38      0.00       1.0 0.100E+04    0.14
    0.00     -0.47      0.00       1.0 0.100E+04    0.15
    0.00     -0.57      0.00       1.0 0.100E+04    0.16
    0.00     -0.66      0.00       1.0 0.988E+03    0.17
    0.00     -0.75      0.00       1.1 0.933E+03    0.18
    0.00     -0.84      0.00       1.1 0.883E+03    0.20
    0.00     -0.94      0.00       1.2 0.838E+03    0.21
 Cumulative travel time =           3. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD152: LIFT OFF/FALL DOWN

 Profile definitions:
   B = Gaussian 1/e (37%) half-width, normal to trajectory
   S = hydrodynamic centerline dilution
   C = centerline concentration (includes reaction effects, if any)

  Inflow (attached) and outflow (free) conditions:
       X         Y         Z         S         C         B
    0.00     -0.94      0.00       1.2 0.838E+03    0.21
    0.00     -1.35      0.00       1.2 0.838E+03    0.15
 Cumulative travel time =           3. sec

END OF MOD152: LIFT OFF/FALL DOWN
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.
 Plume-like motion after lift off/fall down.

 The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
   (up to a factor of 1.5) relative to the last entry of the previous module.
   This is unavoidable due to differences in the width definitions.
   The actual physical transition will be smoothed out.

 Profile definitions:
   B = Gaussian 1/e (37%) half-width, normal to trajectory
   S = hydrodynamic centerline dilution
   C = centerline concentration (includes reaction effects, if any)
```

```
       X         Y         Z         S         C         B
    0.00     -1.35     0.00      1.2 0.838E+03    0.12
    0.00     -1.52     0.04      1.2 0.838E+03    0.14
    0.00     -1.68     0.16      1.2 0.838E+03    0.14
    0.00     -1.80     0.31      1.2 0.838E+03    0.15
    0.00     -1.89     0.47      1.4 0.710E+03    0.16
    0.00     -1.97     0.64      1.7 0.600E+03    0.18
    0.00     -2.04     0.82      2.0 0.512E+03    0.19
    0.00     -2.10     1.01      2.3 0.438E+03    0.21
    0.00     -2.15     1.20      2.6 0.381E+03    0.23
    0.00     -2.20     1.38      3.0 0.335E+03    0.24
    0.00     -2.24     1.57      3.4 0.298E+03    0.26
 Cumulative travel time =          11. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
BEGIN MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      78.16 deg
  Horizontal angle of layer/boundary impingement  =     270.24 deg

 Because of VERY SMALL ambient velocity, BUOYANT SPREADING REGION becomes
   EXCESSIVELY LARGE, greatly exceeding the region of interest.
 NO STEADY-STATE BEHAVIOR likely for this case.           PROGRAM STOPS!

END OF MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
--------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 At the end of the NFR, the plume POSITION EXCEEDS SPECIFIED LIMITS
   for the regulatory mixing zone (RMZ) and/or the region of interest (ROI).
 Specifications may be overly restrictive.
   Use larger ROI values in subsequent iteration!
 SIMULATION ENDS.
 Some BOUNDARY INTERACTION with both banks occurs at end of near-field.
   The dilution values in one or more of the preceding zones may be too high.
 Carefully evaluate results in near-field and check degree of interaction.
--------------------------------------------------------------------------------
BEGIN MOD181: MIXED PLUME/BOUNDED CHANNEL/POSSIBLE UPSTREAM WEDGE INTRUSION

 An UPSTREAM INTRUDING WEDGE is formed along the surface/pycnocline.

 UPSTREAM WEDGE INTRUSION PROPERTIES in bounded channel (laterally uniform):
        Wedge length                          = 4119908.50 m
        X-Position of wedge tip               = ********** m
        Thickness at discharge (end of NFR)   =       1.81 m
         (Wedge thickness gradually decreases to zero at wedge tip.)

 In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times
   the local water depth.
 This may be caused by a very small ambient velocity, perhaps in combination
   with large discharge buoyancy.
 If the ambient conditions are strongly transient (e.g. tidal), then the
   CORMIX steady-state predictions of upstream intrusion are probably
   unrealistic.
 The plume predictions prior to boundary impingement and wedge formation
  will be acceptable, however.

       X         Y         Z         S         C        BV        BH        ZU        ZL
 10560.98    161.54      1.57      3.4 0.298E+03    1.83    483.00      2.48      0.65
 Cumulative travel time =          11. sec

 VERTICALLY AND LATERALLY FULLY MIXED over layer depth: END OF SIMULATION!
```

END OF MOD181: MIXED PLUME/BOUNDED CHANNEL/POSSIBLE UPSTREAM WEDGE INTRUSION

CORMIX1: Submerged Single Port Discharges End of Prediction File

11111111111111111111111111111111111111111111111111111111111111111111111111111111111111111

```
 CORMIX1 PREDICTION FILE:
 1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                          CORMIX-GI Version 4.2GT
                       HYDRO1 Version 4.2 August 2002
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 CASE DESCRIPTION
  Site name/label:    Reedville WWTP
  Design case:        1 hr. after LWS
  FILE NAME:          D:\Cormix\MyFiles\Reedville\Reedville b.prd
  Time stamp:         Wed Dec 31 09:45:09 2003

 ENVIRONMENT PARAMETERS (metric units)
  Bounded section
  BS     =     483.00  AS     =     898.38  QA     =      44.92  ICHREG= 1
  HA     =       1.86  HD     =       1.86
  Tidal Simulation at TIME =       1.000 h
  PERIOD=     12.40 h UAmax =       0.120 dUa/dt=       0.050 (m/s)/h
  UA     =       0.050 F     =       0.313 USTAR =0.9884E-02
  UW     =       2.000 UWSTAR=0.2198E-02
  Uniform density environment
  STRCND=  U          RHOAM =  999.7000

 DISCHARGE PARAMETERS (metric units)
  BANK   =  LEFT      DISTB =    161.54
  D0     =       0.203 A0     =       0.032 H0     =       0.10
  THETA  =       0.00  SIGMA  =     270.00
  U0     =       0.270 Q0     =       0.009       =0.8763E-02
  RHO0   =  996.3187  DRHO0 =0.3381E+01  GP0    =0.3317E-01
  C0     =0.1000E+04  CUNITS=  ppb
  IPOLL  =  1         KS     =0.0000E+00  KD     =0.0000E+00

 FLUX VARIABLES (metric units)
  Q0     =0.8763E-02  M0     =0.2365E-02  J0     =0.2906E-03  SIGNJ0=       1.0
  Associated length scales (meters)
  LQ     =       0.18  LM     =       0.63  Lm     =       0.97  Lb     =       2.33
                                            Lmp    =   99999.00  Lbp    =   99999.00
  Tidal:               Tu     =    0.1755 h Lu     =       5.543 Lmin   =       1.501

 NON-DIMENSIONAL PARAMETERS
  FR0    =       3.29  R      =       5.40

 FLOW CLASSIFICATION
  1111111111111111111111111111111111111111111
  1  Flow class (CORMIX1)       =    H4-90A41
  1  Applicable layer depth HS =      1.86  1
  1111111111111111111111111111111111111111111

 MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
  C0     =0.1000E+04  CUNITS=  ppb
  NTOX   =  0
  NSTD   =  0
  REGMZ  =  0
  XINT   =   6000.00  XMAX   =   6000.00

 X-Y-Z COORDINATE SYSTEM:
     ORIGIN is located at the bottom and below the center of the port:
        161.54 m  from the LEFT  bank/shore.
     X-axis points downstream, Y-axis points to left, Z-axis points upward.
 NSTEP = 10 display intervals per module
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 BEGIN MOD101: DISCHARGE MODULE
```

COANDA ATTACHMENT immediately following the discharge.

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.14

END OF MOD101: DISCHARGE MODULE

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in weak crossflow.
Bottom-attached jet motion.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
Half wall jet, attached to bottom.
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.10
0.00	-0.09	0.00	1.0	0.100E+04	0.11
0.01	-0.18	0.00	1.0	0.100E+04	0.12
0.01	-0.28	0.00	1.0	0.100E+04	0.13
0.02	-0.38	0.00	1.0	0.100E+04	0.15
0.04	-0.47	0.00	1.0	0.100E+04	0.16
0.05	-0.56	0.00	1.0	0.100E+04	0.17
0.07	-0.65	0.00	1.0	0.968E+03	0.18
0.10	-0.74	0.00	1.1	0.902E+03	0.19
0.12	-0.83	0.00	1.2	0.840E+03	0.21
0.15	-0.92	0.00	1.3	0.784E+03	0.22

Cumulative travel time = 3. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD152: LIFT OFF/FALL DOWN

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Inflow (attached) and outflow (free) conditions:

X	Y	Z	S	C	B
0.15	-0.92	0.00	1.3	0.784E+03	0.22
0.31	-1.34	0.00	1.2	0.805E+03	0.16

Cumulative travel time = 5. sec

END OF MOD152: LIFT OFF/FALL DOWN

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in weak crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.31	-1.34	0.00	1.2	0.805E+03	0.11
0.40	-1.54	0.03	1.2	0.815E+03	0.15
0.52	-1.71	0.13	1.4	0.724E+03	0.18
0.66	-1.86	0.27	1.8	0.557E+03	0.21
0.80	-1.96	0.42	2.2	0.450E+03	0.23
0.95	-2.04	0.60	2.7	0.364E+03	0.26
1.09	-2.11	0.77	3.3	0.303E+03	0.29
1.24	-2.16	0.94	3.9	0.256E+03	0.32
1.39	-2.21	1.11	4.5	0.221E+03	0.34
1.55	-2.25	1.29	5.2	0.191E+03	0.38
1.71	-2.28	1.46	5.9	0.168E+03	0.40

Cumulative travel time = 18. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 45.91 deg
Horizontal angle of layer/boundary impingement = 348.70 deg

UPSTREAM INTRUSION PROPERTIES:

Upstream intrusion length	=	1.20 m
X-position of upstream stagnation point	=	0.52 m
Thickness in intrusion region	=	0.50 m
Half-width at downstream end	=	2.11 m
Thickness at downstream end	=	0.50 m

Control volume inflow:

X	Y	Z	S	C	B
1.71	-2.28	1.46	5.9	0.168E+03	0.40

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
0.52	-2.28	1.86	8657.0	0.000E+00	0.00	0.00	1.86	1.86
0.56	-2.28	1.86	25.0	0.399E+02	0.12	0.30	1.86	1.74
0.78	-2.28	1.86	10.4	0.963E+02	0.29	0.73	1.86	1.57
1.00	-2.28	1.86	7.8	0.128E+03	0.38	0.98	1.86	1.48
1.22	-2.28	1.86	6.7	0.149E+03	0.44	1.18	1.86	1.42
1.44	-2.28	1.86	6.2	0.162E+03	0.48	1.36	1.86	1.38
1.66	-2.28	1.86	6.0	0.168E+03	0.50	1.51	1.86	1.36
1.88	-2.28	1.86	6.3	0.158E+03	0.50	1.65	1.86	1.36
2.11	-2.28	1.86	7.6	0.131E+03	0.50	1.78	1.86	1.36
2.33	-2.28	1.86	8.9	0.113E+03	0.50	1.90	1.86	1.36
2.55	-2.28	1.86	9.5	0.105E+03	0.50	2.01	1.86	1.36
2.77	-2.28	1.86	9.8	0.102E+03	0.50	2.11	1.86	1.36

Cumulative travel time = 39. sec

END OF MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD141: BUOYANT AMBIENT SPREADING

Profile definitions:
  BV = top-hat thickness, measured vertically
  BH = top-hat half-width, measured horizontally in Y-direction
  ZU = upper plume boundary (Z-coordinate)
  ZL = lower plume boundary (Z-coordinate)
  S = hydrodynamic average (bulk) dilution
  C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
2.77	-2.28	1.86	9.8	0.102E+03	0.50	2.11	1.86	1.36
12.88	-2.28	1.86	13.0	0.772E+02	0.28	5.97	1.86	1.58
22.99	-2.28	1.86	21.2	0.471E+02	0.31	8.79	1.86	1.55
33.10	-2.28	1.86	37.2	0.269E+02	0.41	11.20	1.86	1.45
43.21	-2.28	1.86	63.4	0.158E+02	0.54	13.38	1.86	1.32
53.32	-2.28	1.86	101.7	0.983E+01	0.70	15.40	1.86	1.16
63.43	-2.28	1.86	153.4	0.652E+01	0.89	17.29	1.86	0.97
73.55	-2.28	1.86	218.9	0.457E+01	1.10	19.09	1.86	0.76
73.58	-2.28	1.86	219.1	0.457E+01	1.10	19.10	1.86	0.76

Cumulative travel time = 1455. sec

CORMIX prediction has been TERMINATED at last prediction interval.
  Limiting distance due to TIDAL REVERSAL has been reached.

END OF MOD141: BUOYANT AMBIENT SPREADING

CORMIX1: Submerged Single Port Discharges End of Prediction File

11111111111111111111111111111111111111111111111111111111111111111111111111111111111111

```
CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                          CORMIX-GI Version 4.2GT
                       HYDRO1 Version 4.2 August 2002
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Reedville WWTP
 Design case:       2 hr. after LWS
 FILE NAME:         D:\Cormix\MyFiles\Reedville\Reedville c.prd
 Time stamp:        Wed Dec 31 09:46:02 2003

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    483.00  AS    =    936.54  QA    =     93.65  ICHREG= 1
 HA    =      1.94  HD    =      1.94
 Tidal Simulation at TIME =      2.000 h
 PERIOD=    12.40 h UAmax =      0.120 dUa/dt=      0.050 (m/s)/h
 UA    =      0.100 F     =      0.308 USTAR =0.1963E-01
 UW    =      2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U         RHOAM =  999.7000

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT      DISTB =    161.54
 D0    =      0.203 A0    =      0.032 H0    =      0.10
 THETA =      0.00  SIGMA =    270.00
 U0    =      0.270 Q0    =      0.009       =0.8763E-02
 RHO0  =  996.3187  DRHO0 =0.3381E+01  GP0   =0.3317E-01
 C0    =0.1000E+04  CUNITS=  ppb
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES (metric units)
 Q0    =0.8763E-02  M0    =0.2365E-02  J0    =0.2906E-03  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =      0.18  LM    =      0.63  Lm    =      0.49  Lb    =      0.29
                                       Lmp   =  99999.00  Lbp   =  99999.00
 Tidal:             Tu    =   0.1755 h Lu    =      5.543 Lmin  =      1.501

NON-DIMENSIONAL PARAMETERS
 FR0   =      3.29  R     =      2.70

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H1A3   1
 1  Applicable layer depth HS =     1.94  1
 11111111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+04  CUNITS=  ppb
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   6000.00  XMAX  =   6000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
       161.54 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 10 display intervals per module
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE
```

COANDA ATTACHMENT immediately following the discharge.

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.14

END OF MOD101: DISCHARGE MODULE

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in strong crossflow.
Bottom-attached jet motion.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
Half wall jet, attached to bottom.
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.10
0.00	-0.09	0.00	1.0	0.100E+04	0.11
0.01	-0.18	0.00	1.0	0.100E+04	0.12
0.03	-0.28	0.00	1.0	0.100E+04	0.14
0.06	-0.37	0.00	1.0	0.100E+04	0.15
0.10	-0.46	0.00	1.1	0.948E+03	0.17
0.15	-0.54	0.00	1.2	0.833E+03	0.19
0.20	-0.61	0.00	1.4	0.739E+03	0.21
0.27	-0.68	0.00	1.5	0.656E+03	0.22
0.34	-0.74	0.00	1.7	0.587E+03	0.24
0.41	-0.80	0.00	1.9	0.531E+03	0.26

Cumulative travel time = 3. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD152: LIFT OFF/FALL DOWN

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Inflow (attached) and outflow (free) conditions:

X	Y	Z	S	C	B
0.41	-0.80	0.00	1.9	0.531E+03	0.26
0.82	-1.11	0.00	1.8	0.547E+03	0.18

Cumulative travel time = 7. sec

END OF MOD152: LIFT OFF/FALL DOWN

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in strong crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.82	-1.11	0.00	1.8	0.547E+03	0.13
1.21	-1.31	0.05	2.2	0.457E+03	0.19
1.63	-1.44	0.17	3.2	0.315E+03	0.24
2.06	-1.53	0.32	4.3	0.232E+03	0.29
2.47	-1.58	0.47	5.5	0.181E+03	0.33
2.89	-1.62	0.62	6.8	0.146E+03	0.37
3.33	-1.66	0.78	8.3	0.121E+03	0.42
3.75	-1.68	0.93	9.7	0.103E+03	0.46
4.17	-1.70	1.08	11.3	0.889E+02	0.50
4.61	-1.71	1.22	12.9	0.776E+02	0.54
5.03	-1.73	1.36	14.5	0.692E+02	0.57

Cumulative travel time = 37. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

Control volume inflow:

X	Y	Z	S	C	B
5.03	-1.73	1.36	14.5	0.692E+02	0.57

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
4.46	-1.72	1.94	14.7	0.680E+02	0.00	0.00	1.94	1.94
4.63	-1.72	1.94	14.6	0.683E+02	0.74	0.37	1.94	1.20
4.80	-1.72	1.94	14.6	0.687E+02	0.88	0.53	1.94	1.06
4.98	-1.73	1.94	14.5	0.691E+02	0.97	0.65	1.94	0.97
5.15	-1.73	1.94	14.8	0.675E+02	1.04	0.75	1.94	0.90
5.32	-1.73	1.94	16.6	0.604E+02	1.08	0.84	1.94	0.85
5.49	-1.73	1.94	19.0	0.526E+02	1.12	0.92	1.94	0.82
5.66	-1.74	1.94	21.2	0.472E+02	1.15	0.99	1.94	0.79
5.84	-1.74	1.94	22.7	0.441E+02	1.17	1.06	1.94	0.77
6.01	-1.74	1.94	23.4	0.428E+02	1.18	1.12	1.94	0.76
6.18	-1.74	1.94	23.8	0.420E+02	1.18	1.18	1.94	0.76

Cumulative travel time = 48. sec

END OF MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD141: BUOYANT AMBIENT SPREADING

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
6.18	-1.74	1.94	23.8	0.420E+02	1.18	1.18	1.94	0.76

```
      7.80    -1.74    1.94    25.3 0.396E+02   0.99     1.56    1.94    0.95
      9.43    -1.74    1.94    26.8 0.373E+02   0.88     1.89    1.94    1.05
     11.05    -1.74    1.94    28.6 0.350E+02   0.83     2.20    1.94    1.11
     12.68    -1.74    1.94    30.7 0.325E+02   0.80     2.48    1.94    1.14
     14.30    -1.74    1.94    33.3 0.300E+02   0.79     2.75    1.94    1.15
     15.92    -1.74    1.94    36.4 0.275E+02   0.79     3.01    1.94    1.15
     17.55    -1.74    1.94    40.0 0.250E+02   0.81     3.26    1.94    1.13
     19.17    -1.74    1.94    44.2 0.226E+02   0.83     3.49    1.94    1.11
     20.79    -1.74    1.94    48.9 0.204E+02   0.86     3.72    1.94    1.08
     22.42    -1.74    1.94    54.3 0.184E+02   0.90     3.95    1.94    1.04
 Cumulative travel time =         211. sec

END OF MOD141: BUOYANT AMBIENT SPREADING
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD161: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

  Vertical diffusivity (initial value)   = 0.762E-02 m^2/s
  Horizontal diffusivity (initial value) = 0.953E-02 m^2/s

 Profile definitions:
   BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
      = or equal to layer depth, if fully mixed
   BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
        measured horizontally in Y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

 Plume Stage 1 (not bank attached):
       X        Y        Z        S        C        BV       BH       ZU       ZL
    22.42    -1.74     1.94    54.3 0.184E+02   0.90     3.95     1.94     1.04
 Plume interacts with BOTTOM.
 The passive diffusion plume becomes VERTICALLY FULLY MIXED within this
   prediction interval.
   360.00    -1.74     1.94   371.4 0.893E+01   1.48     9.59     1.94     0.45
 Cumulative travel time =        3586. sec

 CORMIX prediction has been TERMINATED at last prediction interval.
   Limiting time due to TIDAL REVERSAL has been reached.

END OF MOD161: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CORMIX1: Submerged Single Port Discharges              End of Prediction File
11111111111111111111111111111111111111111111111111111111111111111111111111111111
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CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                          CORMIX-GI Version 4.2GT
                       HYDRO1 Version 4.2 August 2002
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:    Reedville WWTP
 Design case:        Max Flood Velocity
 FILE NAME:          D:\Cormix\MyFiles\Reedville\Reedville d.prd
 Time stamp:         Wed Dec 31 09:46:29 2003

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =    483.00  AS     =    966.00  QA     =    115.92  ICHREG= 1
 HA     =      2.00  HD     =      2.00
 Tidal Simulation at TIME =      3.000 h
 PERIOD=    12.40 h UAmax =      0.120 dUa/dt=      0.040 (m/s)/h
 UA     =      0.120 F      =      0.305 USTAR =0.2344E-01
 UW     =      2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  999.7000

DISCHARGE PARAMETERS (metric units)
 BANK   =  LEFT       DISTB =    161.54
 D0     =      0.203 A0     =      0.032 H0     =      0.10
 THETA  =      0.00  SIGMA  =    270.00
 U0     =      0.270 Q0     =      0.009       =0.8763E-02
 RHO0   =  996.3187  DRHO0 =0.3381E+01  GP0    =0.3317E-01
 C0     =0.1000E+04  CUNITS=  ppb
 IPOLL  =  1         KS     =0.0000E+00  KD     =0.0000E+00

FLUX VARIABLES (metric units)
 Q0     =0.8763E-02  M0     =0.2365E-02  J0     =0.2906E-03  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ     =      0.18  LM     =      0.63  Lm     =      0.41  Lb     =      0.17
                                         Lmp    =  99999.00  Lbp    =  99999.00
 Tidal:               Tu     =   0.2036 h Lu     =      5.971 Lmin   =      1.501

NON-DIMENSIONAL PARAMETERS
 FR0    =      3.29  R      =      2.25

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H1A3   1
 1  Applicable layer depth HS =     2.00  1
 11111111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     =0.1000E+04  CUNITS=  ppb
 NTOX   =  0
 NSTD   =  0
 REGMZ  =  0
 XINT   =   6000.00  XMAX   =   6000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
       161.54 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 10 display intervals per module
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE
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COANDA ATTACHMENT immediately following the discharge.

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.14

END OF MOD101: DISCHARGE MODULE

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in strong crossflow.
Bottom-attached jet motion.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
Half wall jet, attached to bottom.
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.10
0.00	-0.09	0.00	1.0	0.100E+04	0.11
0.02	-0.18	0.00	1.0	0.100E+04	0.13
0.05	-0.27	0.00	1.0	0.100E+04	0.14
0.09	-0.36	0.00	1.0	0.994E+03	0.16
0.14	-0.44	0.00	1.2	0.854E+03	0.18
0.20	-0.52	0.00	1.4	0.738E+03	0.20
0.26	-0.58	0.00	1.5	0.651E+03	0.21
0.34	-0.63	0.00	1.7	0.579E+03	0.23
0.42	-0.69	0.00	1.9	0.522E+03	0.24
0.50	-0.73	0.00	2.1	0.478E+03	0.26

Cumulative travel time = 4. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD152: LIFT OFF/FALL DOWN

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Inflow (attached) and outflow (free) conditions:

X	Y	Z	S	C	B
0.50	-0.73	0.00	2.1	0.478E+03	0.26
0.95	-0.97	0.00	2.0	0.490E+03	0.18

Cumulative travel time = 7. sec

END OF MOD152: LIFT OFF/FALL DOWN

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in strong crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.95	-0.97	0.00	2.0	0.490E+03	0.13
1.49	-1.17	0.06	2.6	0.384E+03	0.20
2.05	-1.28	0.19	3.8	0.260E+03	0.25
2.60	-1.35	0.34	5.2	0.191E+03	0.30
3.16	-1.40	0.50	6.8	0.147E+03	0.34
3.73	-1.43	0.67	8.5	0.118E+03	0.39
4.29	-1.46	0.82	10.2	0.978E+02	0.43
4.85	-1.48	0.97	12.0	0.832E+02	0.47
5.41	-1.49	1.12	13.9	0.720E+02	0.52
5.97	-1.50	1.26	15.8	0.633E+02	0.56
6.56	-1.52	1.41	17.7	0.564E+02	0.59

Cumulative travel time = 43. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

Control volume inflow:

X	Y	Z	S	C	B
6.56	-1.52	1.41	17.7	0.564E+02	0.59

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
5.96	-1.51	2.00	18.0	0.556E+02	0.00	0.00	2.00	2.00
6.14	-1.51	2.00	17.9	0.558E+02	0.76	0.38	2.00	1.24
6.32	-1.51	2.00	17.8	0.561E+02	0.90	0.54	2.00	1.10
6.50	-1.51	2.00	17.8	0.563E+02	0.99	0.66	2.00	1.01
6.68	-1.52	2.00	18.2	0.550E+02	1.05	0.76	2.00	0.95
6.85	-1.52	2.00	20.3	0.492E+02	1.10	0.85	2.00	0.90
7.03	-1.52	2.00	23.4	0.428E+02	1.14	0.93	2.00	0.86
7.21	-1.52	2.00	26.1	0.384E+02	1.17	1.01	2.00	0.83
7.39	-1.52	2.00	27.9	0.359E+02	1.19	1.08	2.00	0.81
7.57	-1.52	2.00	28.8	0.347E+02	1.20	1.14	2.00	0.80
7.75	-1.52	2.00	29.4	0.340E+02	1.20	1.20	2.00	0.80

Cumulative travel time = 53. sec

END OF MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD141: BUOYANT AMBIENT SPREADING

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
7.75	-1.52	2.00	29.4	0.340E+02	1.20	1.20	2.00	0.80

```
      8.44     -1.52     2.00     30.2 0.331E+02    1.13      1.33     2.00     0.87
      9.14     -1.52     2.00     31.0 0.322E+02    1.08      1.45     2.00     0.92
      9.84     -1.52     2.00     31.9 0.313E+02    1.04      1.57     2.00     0.96
     10.53     -1.52     2.00     32.9 0.304E+02    1.01      1.68     2.00     0.99
     11.23     -1.52     2.00     34.0 0.294E+02    0.99      1.79     2.00     1.01
     11.93     -1.52     2.00     35.1 0.285E+02    0.97      1.89     2.00     1.03
     12.62     -1.52     2.00     36.3 0.275E+02    0.96      2.00     2.00     1.04
     13.32     -1.52     2.00     37.7 0.265E+02    0.96      2.10     2.00     1.04
     14.02     -1.52     2.00     39.1 0.255E+02    0.95      2.19     2.00     1.05
     14.71     -1.52     2.00     40.7 0.246E+02    0.96      2.29     2.00     1.04
 Cumulative travel time =          111. sec

 END OF MOD141: BUOYANT AMBIENT SPREADING
 -------------------------------------------------------------------------------
 -------------------------------------------------------------------------------
 BEGIN MOD161: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

   Vertical diffusivity (initial value)    = 0.938E-02 m^2/s
   Horizontal diffusivity (initial value) = 0.117E-01 m^2/s

  Profile definitions:
    BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
       = or equal to layer depth, if fully mixed
    BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
         measured horizontally in Y-direction
    ZU = upper plume boundary (Z-coordinate)
    ZL = lower plume boundary (Z-coordinate)
    S  = hydrodynamic centerline dilution
    C  = centerline concentration (includes reaction effects, if any)

  Plume Stage 1 (not bank attached):
        X         Y         Z         S         C         BV        BH       ZU       ZL
     14.71     -1.52     2.00     40.7 0.246E+02    0.96      2.29     2.00     1.04
  Plume interacts with BOTTOM.
  The passive diffusion plume becomes VERTICALLY FULLY MIXED within this
    prediction interval.
    503.88     -1.52     2.00    621.8 0.557E+01    1.81     11.65     2.00     0.19
  Cumulative travel time =          4187. sec

  CORMIX prediction has been TERMINATED at last prediction interval.
    Limiting distance due to TIDAL REVERSAL has been reached.

 END OF MOD161: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT
 -------------------------------------------------------------------------------
 -------------------------------------------------------------------------------
 CORMIX1: Submerged Single Port Discharges                End of Prediction File
 1111111111111111111111111111111111111111111111111111111111111111111111111111111111
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CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                          CORMIX-GI Version 4.2GT
                       HYDRO1 Version 4.2 August 2002
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Reedville WWTP
 Design case:       HWS
 FILE NAME:         D:\Cormix\MyFiles\Reedville\Reedville e.prd
 Time stamp:        Wed Dec 31 09:47:22 2003

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    503.00  AS    =   1056.30  QA    =      0.10  ICHREG= 1
 HA    =      2.10  HD    =      2.10
 UA    =     0.000  F     =     0.300 USTAR =0.1834E-04
 UW    =     2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U         RHOAM =  999.7000

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT      DISTB =    161.54
 D0    =     0.203 A0    =     0.032 H0    =      0.10
 THETA =      0.00  SIGMA =    270.00
 U0    =     0.270 Q0    =     0.009       =0.8763E-02
 RHO0  =  996.3187  DRHO0 =0.3381E+01  GP0   =0.3317E-01
 C0    =0.1000E+04  CUNITS=  ppb
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES (metric units)
 Q0    =0.8763E-02  M0    =0.2365E-02  J0    =0.2906E-03  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =      0.18  LM    =      0.63  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =      3.29  R     =  99999.00

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H4-90A41
 1  Applicable layer depth HS =     2.10  1
 11111111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+04  CUNITS=  ppb
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   6000.00  XMAX  =   6000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
       161.54 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 10 display intervals per module
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE

 COANDA ATTACHMENT immediately following the discharge.
```

```
       X         Y         Z         S         C         B
    0.00      0.00      0.00      1.0 0.100E+04    0.14

END OF MOD101: DISCHARGE MODULE
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.
 Bottom-attached jet motion.

 Profile definitions:
   B = Gaussian 1/e (37%) half-width, normal to trajectory
           Half wall jet, attached to bottom.
   S = hydrodynamic centerline dilution
   C = centerline concentration (includes reaction effects, if any)

       X         Y         Z         S         C         B
    0.00      0.00      0.00      1.0 0.100E+04    0.10
    0.00     -0.09      0.00      1.0 0.100E+04    0.11
    0.00     -0.18      0.00      1.0 0.100E+04    0.12
    0.00     -0.28      0.00      1.0 0.100E+04    0.13
    0.00     -0.38      0.00      1.0 0.100E+04    0.14
    0.00     -0.47      0.00      1.0 0.100E+04    0.15
    0.00     -0.57      0.00      1.0 0.100E+04    0.16
    0.00     -0.66      0.00      1.0 0.988E+03    0.17
    0.00     -0.75      0.00      1.1 0.933E+03    0.18
    0.00     -0.84      0.00      1.1 0.883E+03    0.20
    0.00     -0.94      0.00      1.2 0.838E+03    0.21
 Cumulative travel time =            3. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD152: LIFT OFF/FALL DOWN

 Profile definitions:
   B = Gaussian 1/e (37%) half-width, normal to trajectory
   S = hydrodynamic centerline dilution
   C = centerline concentration (includes reaction effects, if any)

  Inflow (attached) and outflow (free) conditions:
       X         Y         Z         S         C         B
    0.00     -0.94      0.00      1.2 0.838E+03    0.21
    0.00     -1.35      0.00      1.2 0.838E+03    0.15
 Cumulative travel time =            3. sec

END OF MOD152: LIFT OFF/FALL DOWN
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.
 Plume-like motion after lift off/fall down.

 The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
   (up to a factor of 1.5) relative to the last entry of the previous module.
   This is unavoidable due to differences in the width definitions.
   The actual physical transition will be smoothed out.

 Profile definitions:
   B = Gaussian 1/e (37%) half-width, normal to trajectory
   S = hydrodynamic centerline dilution
   C = centerline concentration (includes reaction effects, if any)
```

```
       X         Y         Z         S         C         B
    0.00     -1.35     0.00      1.2 0.838E+03    0.12
    0.00     -1.55     0.05      1.2 0.838E+03    0.14
    0.00     -1.72     0.20      1.2 0.838E+03    0.14
    0.00     -1.84     0.38      1.3 0.781E+03    0.16
    0.00     -1.94     0.57      1.6 0.643E+03    0.17
    0.00     -2.02     0.77      1.9 0.535E+03    0.19
    0.00     -2.09     0.97      2.2 0.451E+03    0.21
    0.00     -2.15     1.18      2.6 0.385E+03    0.23
    0.00     -2.20     1.39      3.0 0.332E+03    0.25
    0.00     -2.25     1.60      3.5 0.290E+03    0.27
    0.00     -2.29     1.81      3.9 0.257E+03    0.29
 Cumulative travel time =          12. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
BEGIN MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      79.56 deg
  Horizontal angle of layer/boundary impingement  =     270.24 deg

  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
--------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
--------------------------------------------------------------------------------
CORMIX1: Submerged Single Port Discharges              End of Prediction File
11111111111111111111111111111111111111111111111111111111111111111111111111111111
```

```
CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                          CORMIX-GI Version 4.2GT
                       HYDRO1 Version 4.2 August 2002
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Reedville WWTP
 Design case:       1 hr. after HWS
 FILE NAME:         D:\Cormix\MyFiles\Reedville\Reedville f.prd
 Time stamp:        Wed Dec 31 09:47:43 2003

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    483.00  AS    =    985.32  QA    =     29.56  ICHREG= 1
 HA    =      2.04  HD    =      2.04
 Tidal Simulation at TIME =      1.000 h
 PERIOD=    12.40 h UAmax =      0.120 dUa/dt=      0.030 (m/s)/h
 UA    =      0.030 F     =      0.303 USTAR =0.5840E-02
 UW    =      2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U         RHOAM =  999.7000

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT      DISTB =    161.54
 D0    =      0.203 A0    =      0.032 H0    =      0.10
 THETA =      0.00  SIGMA =    270.00
 U0    =      0.270 Q0    =      0.009       =0.8763E-02
 RHO0  =  996.3187  DRHO0 =0.3381E+01  GP0   =0.3317E-01
 C0    =0.1000E+04  CUNITS=  ppb
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES (metric units)
 Q0    =0.8763E-02  M0    =0.2365E-02  J0    =0.2906E-03  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =      0.18  LM    =      0.63  Lm    =      1.62  Lb    =     10.76
                                        Lmp   =  99999.00  Lbp   =  99999.00
 Tidal:             Tu    =   0.2467 h Lu    =      6.572 Lmin  =      1.501

NON-DIMENSIONAL PARAMETERS
 FR0   =      3.29  R     =      9.00

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H4-90A41
 1  Applicable layer depth HS =     2.04  1
 11111111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+04  CUNITS=  ppb
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   6000.00  XMAX  =   6000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
       161.54 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 10 display intervals per module
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE
```

COANDA ATTACHMENT immediately following the discharge.

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.14

END OF MOD101: DISCHARGE MODULE

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in weak crossflow.
Bottom-attached jet motion.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
Half wall jet, attached to bottom.
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.10
0.00	-0.09	0.00	1.0	0.100E+04	0.11
0.00	-0.18	0.00	1.0	0.100E+04	0.12
0.01	-0.28	0.00	1.0	0.100E+04	0.13
0.01	-0.38	0.00	1.0	0.100E+04	0.14
0.02	-0.47	0.00	1.0	0.100E+04	0.16
0.03	-0.57	0.00	1.0	0.100E+04	0.17
0.04	-0.65	0.00	1.0	0.100E+04	0.18
0.05	-0.75	0.00	1.1	0.944E+03	0.19
0.06	-0.84	0.00	1.1	0.892E+03	0.20
0.08	-0.93	0.00	1.2	0.844E+03	0.21

Cumulative travel time = 3. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD152: LIFT OFF/FALL DOWN

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Inflow (attached) and outflow (free) conditions:

X	Y	Z	S	C	B
0.08	-0.93	0.00	1.2	0.844E+03	0.21
0.15	-1.35	0.00	1.2	0.861E+03	0.15

Cumulative travel time = 4. sec

END OF MOD152: LIFT OFF/FALL DOWN

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet/plume transition motion in weak crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.15	-1.35	0.00	1.2	0.861E+03	0.11
0.19	-1.56	0.04	1.2	0.868E+03	0.14
0.25	-1.74	0.15	1.1	0.876E+03	0.16
0.31	-1.89	0.32	1.4	0.723E+03	0.17
0.38	-2.01	0.50	1.7	0.592E+03	0.19
0.45	-2.10	0.70	2.0	0.491E+03	0.21
0.52	-2.18	0.89	2.4	0.416E+03	0.23
0.59	-2.25	1.09	2.8	0.354E+03	0.26
0.67	-2.31	1.29	3.3	0.304E+03	0.28
0.75	-2.36	1.50	3.8	0.264E+03	0.30
0.83	-2.40	1.70	4.3	0.232E+03	0.33

Cumulative travel time = 14. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 65.45 deg
Horizontal angle of layer/boundary impingement = 332.56 deg

UPSTREAM INTRUSION PROPERTIES:

Upstream intrusion length	=	3.25 m
X-position of upstream stagnation point	=	-2.42 m
Thickness in intrusion region	=	0.22 m
Half-width at downstream end	=	5.41 m
Thickness at downstream end	=	0.22 m

Control volume inflow:

X	Y	Z	S	C	B
0.83	-2.40	1.70	4.3	0.232E+03	0.33

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
-2.42	-2.40	2.04	8638.5	0.000E+00	0.00	0.00	2.04	2.04
-2.30	-2.40	2.04	17.8	0.561E+02	0.05	0.77	2.04	1.99
-1.72	-2.40	2.04	7.5	0.133E+03	0.13	1.86	2.04	1.91
-1.13	-2.40	2.04	5.7	0.175E+03	0.17	2.52	2.04	1.87
-0.55	-2.40	2.04	4.9	0.202E+03	0.19	3.03	2.04	1.85
0.04	-2.40	2.04	4.5	0.220E+03	0.21	3.48	2.04	1.83
0.62	-2.40	2.04	4.3	0.230E+03	0.22	3.87	2.04	1.82
1.20	-2.40	2.04	4.4	0.228E+03	0.22	4.22	2.04	1.82
1.79	-2.40	2.04	5.2	0.191E+03	0.22	4.55	2.04	1.82
2.37	-2.40	2.04	6.2	0.161E+03	0.22	4.86	2.04	1.82
2.95	-2.40	2.04	6.7	0.148E+03	0.22	5.14	2.04	1.82
3.54	-2.40	2.04	6.9	0.145E+03	0.22	5.41	2.04	1.82

Cumulative travel time = 104. sec

END OF MOD132: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD141: BUOYANT AMBIENT SPREADING

Profile definitions:
  BV = top-hat thickness, measured vertically
  BH = top-hat half-width, measured horizontally in Y-direction
  ZU = upper plume boundary (Z-coordinate)
  ZL = lower plume boundary (Z-coordinate)
  S = hydrodynamic average (bulk) dilution
  C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
3.54	-2.40	2.04	6.9	0.145E+03	0.22	5.41	2.04	1.82
24.08	-2.40	2.04	11.5	0.869E+02	0.16	15.67	2.04	1.88
44.63	-2.40	2.04	26.7	0.374E+02	0.24	23.09	2.04	1.80
54.00	-2.40	2.04	41.0	0.282E+02	0.30	26.01	2.04	1.74

Cumulative travel time = 1786. sec

CORMIX prediction has been TERMINATED at last prediction interval.
  Limiting time due to TIDAL REVERSAL has been reached.

END OF MOD141: BUOYANT AMBIENT SPREADING

CORMIX1: Submerged Single Port Discharges End of Prediction File

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CORMIX1 PREDICTION FILE:
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
                        CORMIX MIXING ZONE EXPERT SYSTEM
              Subsystem CORMIX1:  Submerged Single Port Discharges
                          CORMIX-GI Version 4.2GT
                       HYDRO1 Version 4.2 August 2002
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Reedville WWTP
 Design case:       2 hr. after HWS
 FILE NAME:         D:\Cormix\MyFiles\Reedville\Reedville g.prd
 Time stamp:        Wed Dec 31 09:48:15 2003

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    483.00  AS    =    966.00  QA    =     77.28  ICHREG= 1
 HA    =      2.00  HD    =      2.00
 Tidal Simulation at TIME =      2.000 h
 PERIOD=    12.40 h UAmax =      0.120 dUa/dt=      0.040 (m/s)/h
 UA    =      0.080 F     =      0.305 USTAR =0.1563E-01
 UW    =      2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U         RHOAM =  999.7000

DISCHARGE PARAMETERS (metric units)
 BANK  =  LEFT      DISTB =    161.54
 D0    =      0.203 A0    =      0.032 H0    =      0.10
 THETA =      0.00  SIGMA =    270.00
 U0    =      0.270 Q0    =      0.009       =0.8763E-02
 RHO0  =  996.3187  DRHO0 =0.3381E+01  GP0   =0.3317E-01
 C0    =0.1000E+04  CUNITS=  ppb
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES (metric units)
 Q0    =0.8763E-02  M0    =0.2365E-02  J0    =0.2906E-03  SIGNJ0=      1.0
 Associated length scales (meters)
 LQ    =      0.18  LM    =      0.63  Lm    =      0.61  Lb    =      0.57
                                        Lmp   =  99999.00  Lbp   =  99999.00
 Tidal:             Tu    =   0.2036 h Lu    =     5.971  Lmin  =     1.501

NON-DIMENSIONAL PARAMETERS
 FR0   =      3.29  R     =      3.37

FLOW CLASSIFICATION
 11111111111111111111111111111111111111111
 1  Flow class (CORMIX1)      =    H2A5   1
 1  Applicable layer depth HS =     2.00  1
 11111111111111111111111111111111111111111

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+04  CUNITS=  ppb
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   6000.00  XMAX  =   6000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and below the center of the port:
       161.54 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 10 display intervals per module
------------------------------------------------------------------------------
------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE
```

COANDA ATTACHMENT immediately following the discharge.

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.14

END OF MOD101: DISCHARGE MODULE

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet-like motion in weak crossflow.
Bottom-attached jet motion.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
Half wall jet, attached to bottom.
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
0.00	0.00	0.00	1.0	0.100E+04	0.10
0.01	-0.18	0.00	1.0	0.100E+04	0.12
0.04	-0.36	0.00	1.0	0.100E+04	0.15
0.10	-0.53	0.00	1.1	0.939E+03	0.18
0.18	-0.69	0.00	1.3	0.773E+03	0.21
0.28	-0.84	0.00	1.6	0.632E+03	0.24
0.41	-0.97	0.00	1.9	0.526E+03	0.28
0.56	-1.09	0.00	2.2	0.445E+03	0.31
0.71	-1.19	0.00	2.6	0.389E+03	0.34
0.87	-1.28	0.00	2.9	0.346E+03	0.36
1.03	-1.36	0.00	3.2	0.316E+03	0.39

Cumulative travel time = 10. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Residual BUOYANCY in deflected wall-jet is sufficiently strong
to cause LIFT-OFF.
Further flow configuration resembles flow class A3.

BEGIN MOD152: LIFT OFF/FALL DOWN

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Inflow (attached) and outflow (free) conditions:

X	Y	Z	S	C	B
1.03	-1.36	0.00	3.2	0.316E+03	0.39
1.74	-1.67	0.00	3.1	0.326E+03	0.27

Cumulative travel time = 16. sec

END OF MOD152: LIFT OFF/FALL DOWN

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Jet-like motion in weak crossflow.
Plume-like motion after lift off/fall down.

The WIDTH PREDICTION B in the first entry below may exhibit some mismatch
(up to a factor of 1.5) relative to the last entry of the previous module.
This is unavoidable due to differences in the width definitions.
The actual physical transition will be smoothed out.

Profile definitions:
B = Gaussian 1/e (37%) half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	B
1.74	-1.67	0.00	3.1	0.326E+03	0.20
2.08	-1.80	0.04	3.0	0.331E+03	0.24
2.43	-1.89	0.15	3.6	0.280E+03	0.28
2.79	-1.97	0.29	4.6	0.220E+03	0.32
3.13	-2.02	0.45	5.6	0.178E+03	0.36
3.48	-2.06	0.61	6.8	0.147E+03	0.41
3.82	-2.09	0.77	8.1	0.124E+03	0.45
4.17	-2.12	0.93	9.4	0.106E+03	0.49
4.49	-2.14	1.08	10.8	0.927E+02	0.53
4.84	-2.15	1.24	12.3	0.815E+02	0.57
5.19	-2.17	1.39	13.8	0.724E+02	0.61

Cumulative travel time = 45. sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

Control volume inflow:

X	Y	Z	S	C	B
5.19	-2.17	1.39	13.8	0.724E+02	0.61

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
4.59	-2.16	2.00	14.0	0.712E+02	0.00	0.00	2.00	2.00
4.77	-2.16	2.00	14.0	0.716E+02	0.81	0.41	2.00	1.19
4.95	-2.16	2.00	13.9	0.720E+02	0.96	0.57	2.00	1.04
5.13	-2.17	2.00	13.8	0.723E+02	1.05	0.70	2.00	0.95
5.31	-2.17	2.00	14.1	0.707E+02	1.12	0.81	2.00	0.88
5.49	-2.17	2.00	15.8	0.632E+02	1.18	0.91	2.00	0.82
5.67	-2.18	2.00	18.2	0.551E+02	1.22	0.99	2.00	0.78
5.86	-2.18	2.00	20.2	0.494E+02	1.25	1.07	2.00	0.75
6.04	-2.18	2.00	21.6	0.462E+02	1.27	1.15	2.00	0.73
6.22	-2.19	2.00	22.4	0.447E+02	1.28	1.22	2.00	0.72
6.40	-2.19	2.00	22.8	0.439E+02	1.28	1.28	2.00	0.72

Cumulative travel time = 60. sec

END OF MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD141: BUOYANT AMBIENT SPREADING

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
6.40	-2.19	2.00	22.8	0.439E+02	1.28	1.28	2.00	0.72
9.95	-2.19	2.00	25.7	0.390E+02	0.86	2.29	2.00	1.14
13.51	-2.19	2.00	28.7	0.348E+02	0.74	3.10	2.00	1.26
17.06	-2.19	2.00	32.9	0.304E+02	0.70	3.82	2.00	1.30
20.62	-2.19	2.00	38.7	0.259E+02	0.71	4.48	2.00	1.29
24.17	-2.19	2.00	46.2	0.216E+02	0.74	5.09	2.00	1.26
27.73	-2.19	2.00	55.8	0.179E+02	0.80	5.66	2.00	1.20
31.28	-2.19	2.00	67.6	0.148E+02	0.87	6.21	2.00	1.13
34.83	-2.19	2.00	82.0	0.122E+02	0.95	6.74	2.00	1.05
38.39	-2.19	2.00	99.2	0.101E+02	1.05	7.24	2.00	0.95
41.94	-2.19	2.00	119.4	0.838E+01	1.16	7.73	2.00	0.84

Cumulative travel time = 504. sec

END OF MOD141: BUOYANT AMBIENT SPREADING

BEGIN MOD161: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Vertical diffusivity (initial value) = 0.626E-02 m^2/s
Horizontal diffusivity (initial value) = 0.782E-02 m^2/s

Profile definitions:
BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed
BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
41.94	-2.19	2.00	119.4	0.838E+01	1.16	7.73	2.00	0.84

Plume interacts with BOTTOM.
The passive diffusion plume becomes VERTICALLY FULLY MIXED within this prediction interval.

288.00	-2.19	2.00	304.6	0.564E+01	1.50	10.97	2.00	0.50

Cumulative travel time = 3579. sec

CORMIX prediction has been TERMINATED at last prediction interval.
Limiting time due to TIDAL REVERSAL has been reached.

END OF MOD161: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

CORMIX1: Submerged Single Port Discharges End of Prediction File
11111111111111111111111111111111111111111111111111111111111111111111111111111111

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road Glen Allen, VA 23060 **804/527-5020**

Memo to: File

From: Denise Mosca, Environmental Specialist II

Date: February 13, 2004

Regarding Town of Reedville VA0060712's classification as discharging into a TMDL listed water. Cockrell's Creek is listed for Shellfish impairment. VDH-DSS imposes a restriction around every sewage outfall because that use is not compatible with shellfish harvest. According to Jennifer Palmore, PRO, technically this means that at the Reedville outfall that the use is not impaired, because it's an automatic thing with VDH-DSS. Because the use is not impaired at the Reedville outfall, the discharge is not to a TMDL listed stream, and does not need to go to EPA for their consideration prior to permit issuance.

Attachment D

Site Inspection Report

Virginia Department of Environmental Quality

WASTEWATER FACILITY INSPECTION REPORT

FACILITY NAME: Reedville WWTP		**INSPECTION DATE:**	February 18, 2009
		INSPECTOR	Mike Dare
PERMIT No.: VA0060712		**REPORT DATE:**	February 25, 2009
TYPE OF FACILITY: ☑ Municipal ☑ Small Minor ☐ Industrial ☐ Federal		**TIME OF INSPECTION:**	Arrival 1000 hrs. / Departure 1200 hrs.
		TOTAL TIME SPENT (including prep & travel)	16 hours
PHOTOGRAPHS: ☑ Yes ☐ No		**UNANNOUNCED INSPECTION?**	☐ Yes ☑ No
REVIEWED BY / Date:			
PRESENT DURING INSPECTION: Lee Bowles, Joe Gordon, Clifton Bowles			

TECHNICAL INSPECTION

1. Has there been any new construction? • If so, were plans and specifications approved? Comments: **N/A**	☐ Yes ☑ No
2. Is the Operations and Maintenance Manual approved and up-to-date? Comments: **O&M manual on hand at time of inspection but not reviewed**	☐ Yes ☐ No
3. Are the Permit and/or Operation and Maintenance Manual specified licensed operator being met? Comments: **Permit requires 1-class III Operator; Plant has 1-class III, 1-classIV, 1-OIT, 1-maintenance employee**	☑ Yes ☐ No
4. Are the Permit and/or Operation and Maintenance Manual specified operator staffing requirements being met? Comments: **Not ascertained**	☐ Yes ☐ No
5. Is there an established and adequate program for training personnel? Comments: **OJT, DEQ classes**	☑ Yes ☐ No
6. Are preventive maintenance task schedules being met? Comments: **maintenance log maintained**	☑ Yes ☐ No
7. Does the plant experience any organic or hydraulic overloading? Comments:	☐ Yes ☑ No
8. Has there been any bypassing or overflows since the last inspection? Comments:	☐ Yes ☑ No
9. Is the standby generator (including power transfer switch) operational and exercised regularly? Comments: **There are two emergency generators on site – 1 for the plant and 1 for the influent vacuum pump system; both are run every two weeks under load. The plant generator was not operational due to a bad relay. New relay to be received in 4 days.**	☐ Yes ☑ No
10. Is the plant alarm system operational and tested regularly? Comments: **Alarms on an auto-dialer system.**	☑ Yes ☐ No

Permit #	VA0060712

TECHNICAL INSPECTION

11. Is sludge disposed of in accordance with the approved sludge management plan? ☑ Yes ☐ No
    Comments: **Northern Neck Refuse Service hauls sludge to the West Point landfill.**

12. Is septage received? ☐ Yes ☑ No
    - If so, is septage loading controlled, and are appropriate records maintained?

    Comments: **N/A**

13. Are all plant records (operational logs, equipment maintenance, industrial waste contributors, sampling and testing) available for review and are records adequate? ☑ Yes ☐ No
    Comments:

14. Which of the following records does the plant maintain?
    ☑ Operational logs ☑ Instrument maintenance & calibration
    ☑ Mechanical equipment maintenance ☐ Industrial Waste Contribution (Municipal facilities)
    Comments:

15. What does the operational log contain?
    ☐ Visual observations ☑ Flow Measurement ☑ Laboratory results ☑ Process adjustments
    ☐ Control calculations ☐ Other (specify)
    Comments:

16. What do the mechanical equipment records contain?
    ☑ As built plans and specs ☑ Manufacturers instructions ☑ Lubrication schedules
    ☑ Spare parts inventory ☑ Equipment/parts suppliers
    ☐ Other (specify)
    Comments:

17. What do the industrial waste contribution records contain (Municipal only)?
    ☐ Waste characteristics ☐ Impact on plant ☐ Locations and discharge types
    ☐ Other (specify)
    Comments: **N/A – no industrial wastes received**

18. Which of the following records are kept at the plant and available to personnel?
    ☑ Equipment maintenance records ☑ Operational log ☐ Industrial contributor records
    ☑ Instrumentation records ☑ Sampling and testing records
    Comments:

19. List records not normally available to plant personnel and their location:
    Comments: **N/A**

20. Are the records maintained for the required time period (three or five years)? ☑ Yes ☐ No
    Comments:

Permit #	VA0060712

UNIT PROCESS EVALUATION SUMMARY SHEET

UNIT PROCESS	APPLICABLE	PROBLEMS*	COMMENTS
Sewage Pumping	**yes**		
Flow Measurement (Influent)	**yes**		
Screening/Comminution	**yes**	**3**	*Comminutor o/s; part due to arrive in two weeks*
Grit Removal			
Oil/Water Separator			
Flow Equalization	**yes**		*"3-day holding pond" available for emergency use*
Ponds/Lagoons	**yes**		*"Polishing pond" between clarifier and chlorination*
Imhoff Tank			
Primary Sedimentation			
Trickling Filter			
Septic Tank and Sand Filter			
Rotating Biological Contactor			
Activated Sludge Aeration	**yes**		*Two aeration basins*
Biological Nutrient Removal			
Sequencing Batch Reactor			
Secondary Sedimentation	**yes**		*Two clarifiers*
Flocculation			
Tertiary Sedimentation			
Filtration			
Micro-Screening			
Activated Carbon Adsorption			
Chlorination	**yes**		*Chlorine gas*
Dechlorination	**yes**		*Sulfur dioxide gas*
Ozonation			
Ultraviolet Disinfection			
Post Aeration			
Flow Measurement (Effluent)	**yes**		
Land Application (Effluent)			
Plant Outfall	**yes**		*Plant effluent pumped to submerged diffusers located in Cockrell's Creek*
Sludge Pumping			
Flotation Thickening (DAF)			
Gravity Thickening			
Aerobic Digestion	**yes**		*Center zone of package activated sludge system*
Anaerobic Digestion			
Lime Stabilization			
Centrifugation			
Sludge Press			
Vacuum Filtration			
Drying Beds	**yes**		*6 drying beds*
Thermal Treatment			
Incineration			
Composting			
Land Application (Sludge)			

* Problem Codes

1. Unit Needs Attention
2. Abnormal Influent/Effluent
3. Evidence of Equipment Failure
4. Unapproved Modification or Temporary Repair
5. Evidence of Process Upset
6. Other (explain in comments)

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

Sewage Pumping: There are 7 pump stations in the collection system for this facility. The pump stations were not viewed during this inspection.

Flow Equalization: A "3-day holding pond" is available to receive flow during emergency or unusual conditions. A valve must be manually operated at a diversion chamber in order to utilize this flow equalization basin.

"3-day holding pond"

Screening/Flow Measurement/Comminution: Incoming sewage flows through a bar screen and grit channel and is then measured at a 3" Parshall flume with an ultrasonic sensor. The sewage then flows to a comminutor. The comminutor was out of service at the time of inspection. A repair part is on order.

Activated Sludge Aeration: Two – 100,000 gpd extended aeration activated sludge units were in service. Wasting is planned for basin 1 where the 30 minute settling was 980 ml/L. Basin 2 was settling well. A power outage occurred early on in the inspection, so the basins were not being aerated. (The emergency generator that supplies power to the plant was out of service due to a bad relay. A replacement relay was expected to arrive within four days.)

Sedimentation: Two clarifiers provide secondary clarification.

Aerobic Digestion/Drying Beds: A small digester is located at the center of the package activated sludge system. Six drying beds are utilized for sludge dewatering.

Polishing Pond: The polishing pond receives flow from the clarifier. Effluent from the polishing pond is pumped to the chlorine contact tank.

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

Chlorination/Dechlorination: Chlorine and sulfur dioxide gas are utilized for chlorination/dechlorination respectively. Cylinder scales and Capital Controls Co. feed systems appeared to be in very good condition. Cylinders were secured by chains.

Sulfur Dioxide Feed System

Flow Measurement/Effluent Pumping: The plant effluent flow is measured using a 90 deg. V-notch weir with an ultrasonic sensor. Two wet wells with two submersible pumps in each are utilized to pump the flow to submerged diffusers in Cockrell's Creek.

Pump Stations used to pump effluent to Cockrell's Creek

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0060712

EFFLUENT FIELD DATA: Operator data from earlier in day; *No flow at time of inspection

Flow	*0 MGD	**Dissolved Oxygen**	0.1 mg/L	**TRC (Contact Tank)**	1.8 mg/L
pH	6.9 S.U.	**Temperature**	not not °C	**TRC (Final Effluent)**	<QL mg/L

Was a Sampling Inspection conducted? ☐ Yes (see Sampling Inspection Report) ☑ No

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS:

1. Type of outfall: ☐ Shore based ☑ Submerged Diffuser? ☑ Yes ☐ No
2. Are the outfall and supporting structures in good condition? ☐ Yes ☐ No
3. Final Effluent (evidence of following problems): ☐ Sludge bar ☐ Grease
   ☐ Turbid effluent ☐ Visible foam ☐ Unusual color ☐ Oil sheen
4. Is there a visible effluent plume in the receiving stream? ☐ Yes ☐ No
5. Receiving stream: ☐ No observed problems ☐ Indication of problems (explain below)

   Comments: **Outfall not observed**

REQUIRED CORRECTIVE ACTIONS:

1. Please provide an update on the repair of the plant operations emergency generator.
2. Please provide an update on the repair of the comminutor.

NOTES and COMMENTS:

None

INSPECTION PHOTOS – VA0060712

Bar screens are followed by grit channels, flow measurement and a comminutor (behind trash can at upper right)

1 of 2 clarifiers at left, 1 of 2 aeration basins at right, digester at center (power outage at time of inspection)

Polishing pond

Chlorine contact tank

Dechlorination zone – effluent flow monitoring

1 of 6 sludge drying beds

Attachment E

Effluent Data, Ambient Stream Data, and Limitation Evaluations

Reedville Sanitary District (VA0060712)
DMR Data
May 2005 - December 2009

DMR Due Date	DMR Received Date	Flow		pH		BOD5				TSS				TRC		Fecal Coliform	Total Phosphorus				Orthosphosphate		Total Nitrogen				Ammonia		TKN		Enterococci
		Monthly Average (MGD)	Monthly Maximum (MGD)	Minimum (SU)	Maximum (SU)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Load (kg/d)	Weekly Load (kg/d)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Load (kg/d)	Weekly Load (kg/d)	Monthly Average (µg/L)	Weekly Average (µg/L)	Monthly Average (N/100mL)	Monthly Average (mg/L)	Monthly Load (kg/d)	Monthly Load (kg/m)	Calendar Year Load (kg/yr)	Monthly Average (mg/L)	Monthly Load (kg/d)	Monthly Average (mg/L)	Monthly Load (kg/d)	Monthly Load (kg/m)	Calendar Year Load (kg/yr)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)	Monthly Load (kg/d)	Monthly Geo.Mean (N/100mL)
2005-2010 Permit Limit -->		NL	NL	6.0	9.0	24	26	18	27	24	26	18	27	39	47	200	2.0	1.5	NL	NL	NL	NL	NL	NL	NL	NL	2.4	3.2	NL	NL	35
5/10/2005	5/11/2005	0.0869	0.1754	6.2	6.8	<2	3	<.6578	1.9917	1.6	1.6	0.5263	1.0622	<QL	<QL	<2	1.4	0.4605	0.921	0.921	1.15	0.3783	3.651	11.1	7.302	7.302	<QL	0.1	0.7	0.2302	
6/10/2005	6/10/2005	0.0713	0.1004	6.3	6.7	<QL	<QL	<QL	<QL	1.9	2.3	0.5128	0.874	<QL	<QL	<2	2.45	0.6612	0.931	NULL	NULL	NULL	2.8741	10.65	4.9402	12.2422	0.1	0.3	1.15	0.3104	
7/10/2005	7/11/2005	0.0863	0.1587	6.5	6.8	3.5	5	1.1433	3.0034	2.6	2.6	0.8493	1.5618	<QL	<QL	<2	2.82	0.9211	2.3006	3.8828	2.3	0.7513	2.6785	8.2	5.5863	17.8285	2.1	4.1	3.4	1.1106	
8/10/2005	8/11/2005	0.1018	0.1876	6.4	6.8	6.6	11	2.5431	7.8107	2.6	2.6	1.0018	1.8462	<QL	<QL	4.4	3.84	1.4796	2.8119	6.6947	3.45	1.3293	3.0825	8	7.3847	25.2132	4.2	6	5.9	2.2734	
9/10/2005	9/12/2005	0.1056	0.1876	6.2	6.7	6.1	11	2.4382	7.8107	5	5	1.9985	3.5503	<QL	<QL	<2.7	4.24	1.6947	3.0107	9.7054	3.6	1.4389	5.6757	14.2	10.296	35.5092	2.3	3.7	9.8	3.917	
10/10/2005	10/11/2005	0.0759	0.1406	6.4	6.7	<6	10	<1.7237	5.3217	14	14	4.0219	7.4504	<QL	<QL	<2	2.76	0.7929	1.5327	3.1149	2.8	0.8044	3.7347	13	7.9826	20.2248	1.04	1.7	1.8	0.5171	
11/10/2005	11/10/2005	0.0657	0.1928	6.5	6.8	3.7	5	0.9201	3.6487	5.9	5.9	1.4672	4.3055	<QL	<QL	<2.2	4.01	0.9972	3.1671	6.282	4.3	1.0693	2.9717	11.95	14.0112	34.236	2.1	2.7	4.05	1.0071	
12/10/2005	12/9/2005	0.0786	0.1942	6.1	7.7	7.7	36	2.2383	26.4617	3.2	3.2	0.9302	2.3522	<QL	<QL	<2.4	2.98	0.8663	2.2787	8.5607	2.8	0.8139	5.0289	17.3	12.7163	46.9523	1.9	3.1	3.95	1.1482	
1/10/2006	1/9/2006	0.1038	0.1993	6.3	6.8	<2.1	3	0.8251	2.2631	2.4	2.4	0.9429	1.8104	<QL	<QL	<2	3.18	1.2494	3.2739	11.8346	2.5	0.9822	7.7398	19.7	14.8607	61.813	1.72	2.5	2.4	0.9429	
2/10/2006	2/10/2006	0.1001	0.1973	6.5	6.9	<2.6	10	0.9851	7.4678	1.1	1.1	0.4168	0.4168	<QL	<QL	<2	2.87	1.0874	2.1507	13.9853	2.4	0.9093	6.4409	17	13.218	75.031	1.4	1.9	3.8	1.4397	
3/10/2006	3/10/2006	0.074	0.1485	6.6	7	<2.17	3	<.6078	1.6862	3.2	3.2	0.8963	1.7986	<QL	<QL	<2	2.82	0.7899	1.6637	3.8144	1.95	0.5462	4.1453	14.8	8.8245	22.1425	9.94	108	1.4	0.3921	
4/10/2006	4/11/2006	0.0698	0.1949	6.8	8.3	8.7	18	2.2985	13.2785	10.7	10.7	2.8269	7.8934	<QL	<QL	<2	2.32	0.6129	1.6967	5.5111	1.75	0.4623	3.8173	14.45	11.8769	33.9194	<QL	0.5	2.45	0.6473	
5/10/2006	5/10/2006	0.0737	0.1816	6.6	7.3	<4.3	7	1.1995	0.074	8.1	8.1	2.2595	5.5676	<QL	<QL	<2	2.7	0.7532	2.3851	7.8962	1.8	0.5021	5.1328	18.4	13.3347	47.2541	1.1	3	5	1.3948	
6/10/2006	6/12/2006	0.0779	0.1397	6.5	7	<4	10	1.1794	5.2877	5.1	5.1	1.5037	2.6967	<QL	<QL	<2	2.4	0.7076	1.68	9.5762	1.68	0.4954	4.122	13.98	16.76	64.0141	1.7	2.5	3.6	1.0615	
7/10/2006	7/10/2006	0.0906	0.1985	6.6	7.2	3.9	4	1.3374	3.0053	3.9	3.9	1.3374	2.9302	1.7	1.9	<2	3.6	1.2345	2.8175	12.3937	3.6	1.2345	5.281	15.4	12.3968	76.4109	1.8	2.2	3.3	1.1316	
8/10/2006	8/11/2006	0.0816	0.1969	6.2	6.9	<5.3	11	<1.6369	8.1979	3	3	0.9266	2.2358	<QL	<QL	<135	3.77	1.1644	2.9289	15.3226	3.39	1.047	2.579	8.35	7.3036	83.7145	1.8	3.2	3.75	1.1582	
9/10/2006	9/11/2006	0.0572	0.0639	6.1	6.7	7.2	19	1.5588	4.5954	5.6	5.6	1.2124	1.3544	<QL	<QL	<2.6	4.41	0.9548	2.1332	17.4558	3	0.6495	1.4289	6.6	3.1926	86.9071	0.1	0.2	1.3	0.2815	
10/10/2006	10/11/2006	0.0936	0.1985	6.3	6.9	3.92	12	1.3888	9.0159	5	5	1.7714	3.7566	<QL	<QL	<2.67	3.35	1.1868	3.2382	20.694	1.09	0.3862	2.8874	8.15	6.5365	93.4436	1.38	3.1	1.55	0.5491	
11/10/2006	11/13/2006	0.0983	0.198	6	6.9	<2	<2	<.7441	<1.4989	1.9	1.9	0.7069	<1.4239	<QL	<QL	<2	2.76	1.0269	2.3832	23.0772	1.3	0.4837	3.8695	10.4	6.6025	100.0461	0.78	1.7	1.95	0.7255	
12/10/2006	12/11/2006	0.148	0.1988	6.2	7	<2	<2	1.1204	1.5049	2.6	2.6	1.4565	1.9564	<QL	<QL	<2	2.2	1.2324	1.8435	24.9207	1.38	0.7731	6.8902	12.3	9.6315	109.6776	1.04	2	1.9	1.0643	
1/10/2007	1/11/2007	0.0987	0.193	6.7	7.1	<2	2	<.7472	1.461	2.5	2.5	0.934	1.8263	<QL	<QL	<2	1.63	0.6089	1.198	26.1187	1.43	0.5342	2.503	6.7	8.62	118.2976	1.01	1.3	1.65	0.6164	
2/10/2007	2/12/2007	0.1134	0.199	6.7	7.1	<2.1	3	<.9014	2.2597	1.8	1.8	0.7726	1.3558	<QL	<QL	<2	1.88	0.8069	1.5667	1.5667	1.44	0.6181	5.1506	12	10.9969	10.9969	0.8	1.2	0.65	0.279	
3/10/2007	3/12/2007	0.0838	0.1909	6.4	7.2	<2.5	3	0.793	2.1677	1.6	1.6	0.5075	1.1561	<QL	<QL	<2.2	1.9	0.6026	1.4234	2.9901	1.7	0.5392	4.4088	13.9	10.2603	21.2572	0.7	13	<.3	<.0952	
4/10/2007	4/11/2007	0.0885	0.1989	6.2	7.2	3.08	6	1.0317	4.517	3.4	3.4	1.139	2.5596	<QL	<QL	<2	2.19	0.7336	1.7014	4.6915	1.5	0.5025	4.7566	14.2	11.4431	32.7003	0.17	0.5	0.6	0.201	
5/10/2007	5/11/2007	0.1036	0.1994	6.5	7.5	<2	<2	<.7843	<1.5095	2.3	2.3	0.9019	1.7359	<QL	<QL	<2	2.4	0.9411	1.8491	6.5406	2	0.7843	5.4113	13.8	10.7172	43.4175	0.38	0.7	0.4	0.1569	
6/10/2007	6/11/2007	0.0859	0.1998	7.1	7.8	2.9	10	0.9429	2.5132	52	52	16.9068	13.738	<QL	<QL	<2	2.7	0.8779	0.9419	7.4825	1.75	0.569	4.4868	13.8	3.7515	47.169	2	7.6	1.4	0.4552	
7/10/2007	7/11/2007	0.0711	0.199	7.3	8	6.7	11	1.8031	2.5356	1.2	1.2	0.3229	0.2925	<QL	<QL	<2.9	4.25	1.1437	1.1066	8.5891	3.8	1.0226	2.8257	10.5	2.6569	49.8259	6.8	10.1	9.15	2.4624	
8/10/2007	8/13/2007	0.0751	0.199	7.4	7.8	5.8	30	0.0726	7.8463	<QL	<QL	<QL	<QL	<QL	<QL	<3.8	4.03	1.1455	1.0059	9.595	3.6	1.0233	2.473	8.7	2.521	52.3469	2.1	3.6	2.8	0.7959	
9/10/2007	9/11/2007	0.0806	0.189	7.2	7.8	<QL	<QL	<QL	0.1998	3	3	0.9152	2.1461	<QL	<QL	7.9	3.62	1.1044									0.99	1.3			
10/10/2007	10/12/2007	0.0754	0.197	7.1	7.8	<QL	<QL	<QL	<QL	3.2	3.2	0.9133	2.3861	<QL	<QL	<10.6	3.96	1.1301									1.09	1.8			
11/10/2007	11/13/2007	0.0746	0.182	7.2	7.5	<QL	<QL	<QL	<QL	3.1	3.1	0.8753	2.1355	<QL	<QL	<6.8	4	1.1294									1.22	1.5			
12/10/2007	12/11/2007	0.0949	0.1962	7.2	7.6	<2.42	5	0.8963	3.7131	5.7	5.7	2.0474	4.2329	<QL	<QL	<2	3.81	1.3685									3.2	4.9			
1/10/2008	1/11/2008	0.0874	0.1987	7.1	7.7	<QL	<QL	<QL	<QL	2.3	2.3	0.7609	1.7298	<QL	<QL	<2.17	2.76	0.913									6.1	11.7			
2/10/2008	2/8/2008	0.0951	0.1999	7.2	7.7	<QL	<QL	<QL	<QL	7.9	7.9	2.8436	5.9773	<QL	<QL	<109	3.3	1.1879									11.2	14.4			
3/10/2008	3/11/2008	0.0845	0.1958	7.1	7.8	<QL	<QL	<QL	<QL	3.9	3.9	1.2473	2.8903	<QL	<QL	<2	2.3	0.7356									3.4	4.6			
4/10/2008	4/10/2008	0.0999	0.199	7.5	8.1	<QL	6	<QL	4.5193	4.1	4.1	1.5503	3.0882	<QL	<QL	<2	3.11	1.176									1.76	2.9			
5/10/2008	5/13/2008	0.0706	0.1996	7.5	8.3	<QL	9	<QL	6.7994	6.7	6.7	1.7904	5.0618	<QL	<QL	<2	4.16	1.1116									0.42	0.9			
6/10/2008	6/11/2008	0.1192	0.1965	7	7.7	<3	7	<1.3535	5.2063	8.3	8.3	3.7447	6.1732	<QL	<QL	<16	2.7	1.2182									<.48	1.3			
7/10/2008	7/11/2008	0.074	0.198	6.9	7.3	4.8	16	1.3444	11.9909	3.8	3.8	1.0643	2.8478	<QL	<QL	<2	3	0.8403									2.1	2.1			
8/10/2008	8/12/2008	0.0726	0.1931	6.8	8.1	<5.06	8	1.3904	5.8471	2.5	2.5	0.687	1.8745	<QL	<QL	<2	6.3	1.7312									X	X			
9/10/2008	9/12/2008	0.0642	0.1998	7	7.3	<5.6	<7.6	<1.3608	<5.7475	6.5	6.5	1.5795	4.9156	<QL	<QL	<44.8	5.7	1.3851									2.65	3.91			
10/10/2008	10/10/2008	0.0796	0.1966	6.7	7.2	6.1	15.4	1.8379	11.4596	2.1	2.1	0.6327	1.5627	<QL	<QL	<4.8	5.1	1.5366									1	1.52			
11/10/2008	11/12/2008	0.0869	0.1998	6.9	7.4	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<2	4.04	1.329									0.88	1.26			
12/10/2008	12/10/2008	0.0929	0.199	6.8	7.3	<5.3	8.8	<1.86	6.63	<QL	<QL	<QL	<QL	<QL	<QL	<2.2	3.32	1.17									0.94	1.32			
1/10/2009	1/12/2009	0.1266	0.1995	6.7	7.1	<5.09	6.4	2.439	4.8327	<QL	<QL	<QL	<QL	<QL	<QL	<QL	3.09	1.4807									1.12	2.4			
2/10/2009	2/11/2009	0.0854	0.198	6.9	7.7	<QL	<QL	<QL	<QL	1.6	1.6	0.5172	1.1991	<QL	<QL	<3.7	3.26	1.0538									1.44	2.08			
3/10/2009	3/10/2009	0.0853	0.198	6.8	7.4	<QL	<QL	<QL	<QL	1.8	1.8	0.5812	1.349	<QL	<QL	<2	3.39	1.0945									1.22	1.84			
4/10/2009	4/13/2009	0.138	0.199	6.8	8	<5.1	5.7	2.72	4.29	2.3	2.3	1.58	1.73	<QL	<QL	0.32	3	1.71									0.98	1.97			
5/10/2009	5/11/2009	0.1236	0.1975	6.5	7.3	<5.3	8.7	2.65	1.95	3.4	3.4	2.37	2.37	<QL	<QL	41	2.46	0.05									0.12	0.21			<3.6
6/10/2009	6/11/2009	0.132	0.1996	6.2	6.8	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	<QL	0.3	2.4	0.4851									0.38	1.1			0.69
7/10/2009	7/13/2009	0.1099	0.1987	6.4	6.7	<5.5	8.2	2.4	2.08	1.1	1.1	0.82	0.82	<QL	<QL	0.32	3.8	1.9									1.3	1.6			0.87
8/10/2009	8/11/2009	0.101	0.1988	6.2	6.9	<7	8.8	2.83	1.96	2	2	0.27	0.27	<QL	<QL	0.3	4.44	0.52									2.7	3.32			1.59
9/10/2009	9/11/2009	0.1176	0.1977	6.5	7	6.2	7.7	2.7	5.7	1.8	1.8	1.3	1.3	<QL	<QL	0.64	3.9	1.8									2.3	3			14
10/10/2009	10/13/2009	0.1165	0.1967	6.6	6.9	5.5	8.8	2.6	6.6	2.2	2.2	0.5	0.5	<QL	<QL	72	3.2	1.6									2	2.1			39
11/10/2009	11/12/2009	0.1002	0.1971	6.6	7	<5.4	7.3	2.1	5.5	3.6	3.6	1.4	2.7	<QL	<QL	26	4.14	1.6									2.7	5.39			119
12/10/2009	12/11/2009	0.1755	0.1987	6.8	7.6	<5.2	6.8	3.4	5.1	2.4	2.4	1.6	1.6	<QL	<QL	8	2.6	1.8									2.2	3.7			7
Average		0.1	0.2	6.7	7.3	5.435294118	9.429268293	1.722728125	5.351255814	4.696078	4.703921569	1.581182	2.778872	1.7	1.9	14.6527273	3.262857143	1.087408929	1.997903571	10.11916667	2.35037037	0.7648185	4.144535714	12.41178571	9.133017857	51.067621	2.035962	4.993091	2.955556	0.972937	26.02142857
90th Percentile		0.1	0.2	7.2	7.9	7.4	16	2.695	8.8523	7.9	7.9	2.37	5.60857	1.7	1.9	41	4.245	1.64735	3.05762	21.64728	3.6	1.13538	5.90526	17.09	13.53765	95.42435	3.38	6.96	5.36	1.77318	71
10th Percentile		0.1	0.2	6.2	6.8	3.332	3	0.89868	1.73896	1.6	1.6	0.5128	0.8686	1.7	1.9	0.3	2.25	0.6109	0.9867	3.06498	1.348	0.47514	2.5562	8.105	3.58383	16.15261	0.384	0.58	0.68	0.25948	0.798
Maximum		0.2	0.2		8.3	8.7	36	3.4	26.4617	52	52	16.9068	13.738	1.7	1.9	72	6.3	1.9	3.2739	26.1187	4.3	1.4389	7.7398	19.7	16.76	118.2976	11.2	108	9.8	3.917	119
Minimum		0.1	0.1	6.0		2.9	2	0.0726	0.074	1.1	1.1	0.27	0.27	1.7	1.9	0.3	1.4	0.05	0.921	0.921	1.09	0.3783	1.4289	6.6	2.521	7.302	0.1	0.1	0.4	0.1569	0.69

Reedville Sanitary District
VA0060712
Application 2A Data- 2010 Permit reissuance

Part A.12.

Parameter	Maximum Daily Value		Average Daily Value		
	Value	Units	Value	Units	Number of Samples
pH (minimum)	6.2	s.u.			
pH (maximum)	6.9	s.u.			
Flow Rate	0.138	MGD	0.0925	MGD	558
Temperature (Winter)	16	°C	16	°C	54
Temperature (Summer)	20	°C	20	°C	54

Pollutant		Maximum Daily Discharge		Average Daily Discharge			Analytical Method	ML/MDL
		Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NON-CONVENTIONAL COMPOUNDS								
Biochemical Oxygen Demand (report one)	BOD-5	5.5	mg/L	3.15	mg/L	78	405.1	2.0
	CBOD-5							
Fecal Coliform		3.7	mpn/100mL	1.175	mpn/100mL	786	9221	---
Total Suspended Solids (TSS)		3.4	mg/L	1.783	mg/L	6	160.2	1.0

Part B.6.

Pollutant	Maximum Daily Discharge		Average Daily Discharge			Analytical Method	ML/MDL
	Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NON-CONVENTIONAL COMPOUNDS							
Ammonia (as N)	1.44	mg/L	0.907	mg/L	72	350.3	0.1
Chlorine (TRC)	BQL	ppm	BQL	ppm	100	330.5	0.2
Dissolved Oxygen	9.4	ppm	6.7	ppm	20	360.1	1.0
Total Kjeldahl Nitrogen (TKN)	4.76	mg/L	2.127	mg/L	12	351.4	0.1
Nitrate Plus Nitrite Nitrogen	9.4	mg/L	4.467	mg/L	12	354.1/300.0	0.1
Oil & Grease	<5	mg/L	<5	mg/L	3	EPA 1664A	5.0
Phosphorus (total)	3.8	mg/L	2.652	mg/L	12	365.3	0.01
Total Dissolved Solids	359	mg/L	440	mg/L	3	2540C	1.0
Other							

Reedville Sanitary District (VA0060712): Outfall 001 Summary of Attachment A Testing Data from Laboratory Reports

METALS

CASRN#	CHEMICAL	EPA ANALYSIS USED	TARGET QUANTIFICATION LEVEL (µg/L)	REPORTING RESULTS (µg/L)		REQUIRED SAMPLE TYPE
				Total Recoverable (9/28/2009) Grab	Dissolved (12/28/2009) Grab	
7440-36-0	Antimony	200.7/3120B	220,000	<10	<50	G or C
7440-38-2	Arsenic	200.7/3120B	170	<50	<50	G or C
7440-39-3	Barium					G or C
7440-43-9	Cadmium	200.7/3120B	76	<10	<10	G or C
16065-83-1	Chromium III	200.7/3120B	430	--	<10	G or C
18540-29-9	Chromium VI	200.7/3120B	430	--	9.0	G or C
7440-50-8	Copper	200.7/3120B	22	<20	20	G or C
7439-89-6	Iron					G or C
7439-92-1	Lead	200.7/3120B	80	<50	<50	G or C
7439-96-5	Manganese					G or C
7439-97-6	Mercury	3112B	2.6	<0.2	<0.2	G or C
7440-02-0	Nickel	200.7/3120B	70	<20	<20	G or C
7782-49-2	Selenium, dissolved	200.7/3120B	610	--	<50	G or C
7782-49-2	Selenium, Total Recoverable	200.7/3120B	--	<50	--	G or C
7440-22-4	Silver	200.7/3120B	4.8	<20	<20	G or C
7440-28-0	Thallium	200.7/3120B	(5)	<2	<2	G or C
7440-66-6	Zinc	200.7/3120B	220	13	17	G or C

PESTICIDES/PCB'S

CASRN#	CHEMICAL	EPA ANALYSIS		REQUIRED QUANTIFICATION LEVEL(µg/L)	REPORTING RESULTS (µg/L)	REQUIRED SAMPLE TYPE
		Required	Used		Grab	
309-00-2	Aldrin	608	608	0.05	<0.05	G or C
57-74-9	Chlordane	608	608	0.2	<0.2	G or C
2921-88-2	Chlorpyrifos (synonym = Dursban)	622	622	(5)	<0.2	G or C
72-54-8	DDD	608	608	0.1	<0.10	G or C
72-55-9	DDE	608	608	0.1	<0.10	G or C
50-29-3	DDT	608	608	0.1	<0.10	G or C
8065-48-3	Demeton	(4)	622	(5)	<1	G or C
333-41-5	Diazinon	(4)	622	(5)	<1	G or C
60-57-1	Dieldrin	608	608	0.1	<0.10	G or C
959-98-8	Alpha-Endosulfan	608	608	0.1	<0.10	G or C
33213-65-9	Beta-Endosulfan	608	608	0.1	<0.10	G or C
1031-07-8	Endosulfan Sulfate	608	608	0.1	<0.10	G or C
72-20-8	Endrin	608	608	0.1	<0.10	G or C
7421-93-4	Endrin Aldehyde	608	608	(5)	<0.10	G or C
86-50-0	Guthion	622	622	(5)	<1	G or C
76-44-8	Heptachlor	608	608	0.05	<0.50	G or C
1024-57-3	Heptachlor Epoxide	608	608	(5)	<0.10	G or C
319-84-6	Hexachlorocyclohexane Alpha-BHC	608	608	(5)	<0.50	G or C
319-85-7	Hexachlorocyclohexane Beta-BHC	608	608	(5)	<0.50	G or C
58-89-9	Hexachlorocyclohexane Gamma-BHC or Lindane	608	608	(5)	<0.50	G or C
143-50-0	Kepone	(9)	608	(5)	<0.50	G or C
121-75-5	Malathion	(4)	622	(5)	<1	G or C
72-43-5	Methoxychlor	(4)	608	(5)	<0.10	G or C
2385-85-5	Mirex	(4)	608	(5)	<0.10	G or C
56-38-2	Parathion	(4)	622	(5)	<1	G or C
11096-82-5	PCB 1260	608	608	1.0	<1.0	G or C
11097-69-1	PCB 1254	608	608	1.0	<1.0	G or C
12672-29-6	PCB 1248	608	608	1.0	<1.0	G or C
53469-21-9	PCB 1242	608	608	1.0	<1.0	G or C
11141-16-5	PCB 1232	608	608	1.0	<1.0	G or C
11104-28-2	PCB 1221	608	608	1.0	<1.0	G or C
12674-11-2	PCB 1016	608	608	1.0	<1.0	G or C
1336-36-3	PCB Total	608	608	7.0	<1.0	G or C
8001-35-2	Toxaphene	608	608	5.0	<5.0	G or C

BASE NEUTRAL EXTRACTABLES

CASRN#	CHEMICAL	EPA ANALYSIS		REQUIRED QUANTIFICATION LEVEL(µg/L)	REPORTING RESULTS (µg/L)	REQUIRED SAMPLE TYPE
		Required	Used		Grab	
83-32-9	Acenaphthene	625	625	10.0	<5.0	G or C
120-12-7	Anthracene	625	625	10.0	<5.0	G or C
92-87-5	Benzidine	(4)	625	(5)	<5.0	G or C
56-55-3	Benzo (a) anthracene	625	625	10.0	<5.0	G or C
205-99-2	Benzo (b) fluoranthene	625	625	10.0	<5.0	G or C
207-08-9	Benzo (k) fluoranthene	625	625	10.0	<5.0	G or C
50-32-8	Benzo (a) pyrene	625	625	10.0	<5.0	G or C
111-44-4	Bis 2-Chloroethyl Ether	(4)	625	(5)	<5.0	G or C
108-60-1	Bis 2-Chloroisopropyl Ether	(4)	625	(5)	<5.0	G or C
85-68-7	Butyl benzyl phthalate	625	625	10.0	<5.0	G or C
91-58-7	2-Chloronaphthalene	(4)	625	(5)	<5.0	G or C
218-01-9	Chrysene	625	625	10.0	<5.0	G or C
53-70-3	Dibenz(a,h)anthracene	625	625	20.0	<5.0	G or C
84-74-2	Dibutyl phthalate (synonym = Di-n-Butyl	625	625	10.0	<5.0	G or C
95-50-1	1,2-Dichlorobenzene	624	624	10.0	<5.0	G or C
541-73-1	1,3-Dichlorobenzene	624	624	10.0	<5.0	G or C
106-46-7	1,4-Dichlorobenzene	624	624	10.0	<5.0	G or C
91-94-1	3,3-Dichlorobenzidine	(4)	625	(5)	<5.0	G or C
84-66-2	Diethyl phthalate	625	625	10.0	<5.0	G or C
117-81-7	Bis-2-ethylhexyl phthalate	625	625	10.0	<5.0	G or C
131-11-3	Dimethyl phthalate	(4)	625	(5)	<5.0	G or C
121-14-2	2,4-Dinitrotoluene	625	625	10.0	<5.0	G or C
122-66-7	1,2-Diphenylhydrazine	(4)	625	(5)	<5.0	G or C
206-44-0	Fluoranthene	625	625	10.0	<5.0	G or C
86-73-7	Fluorene	625	625	10.0	<5.0	G or C
118-74-1	Hexachlorobenzene	(4)	625	(5)	<5.0	G or C
87-68-3	Hexachlorobutadiene	(4)	625	(5)	<5.0	G or C
77-47-4	Hexachlorocyclopentadie	(4)	625	(5)	<5.0	G or C
67-72-1	Hexachloroethane	(4)	625	(5)	<5.0	G or C
193-39-5	Indeno(1,2,3-cd)pyrene	625	625	20.0	<5.0	G or C
78-59-1	Isophorone	625	625	10.0	<5.0	G or C
98-95-3	Nitrobenzene	625	625	10.0	<5.0	G or C
62-75-9	N-Nitrosodimethylamine	(4)	625	(5)	<5.0	G or C
621-64-7	N-Nitrosodi-n-propylamine	(4)	625	(5)	<5.0	G or C
86-30-6	N-Nitrosodiphenylamine	(4)	625	(5)	<5.0	G or C
129-00-0	Pyrene	625	625	10.0	<5.0	G or C
120-82-1	1,2,4-Trichlorobenzene	625	625	10.0	<5.0	G or C

VOLATILES

CASRN#	CHEMICAL	EPA ANALYSIS		REQUIRED QUANTIFICATION LEVEL (µg/L)	REPORTING RESULTS (µg/L)	REQUIRED SAMPLE TYPE
		Required	Used		Grab	
107-02-8	Acrolein	(4)	624	(5)	<5.0	G
107-13-1	Acrylonitrile	(4)	624	(5)	<5.0	G
71-43-2	Benzene	624	624	10	<5.0	G
75-25-2	Bromoform	624	624	10	<5.0	G
56-23-5	Carbon Tetrachloride	624	624	10	<5.0	G
108-90-7	Chlorobenzene (synonym = monochlorobenzene)	624	624	50	<5.0	G
124-48-1	Chlorodibromomethane	624	624	10	<5.0	G
67-66-3	Chloroform	624	624	10	7.1	G
75-09-2	Dichloromethane (synonym = methylene chloride)	624	624	20	6.5	G
75-27-4	Dichlorobromomethane	624	624	10	6.1	G
107-06-2	1,2-Dichloroethane	624	624	10	<5.0	G
75-35-4	1,1-Dichloroethylene	624	624	10	<5.0	G
156-60-5	1,2-trans-dichloroethylene	(4)	624	(5)	<5.0	G
78-87-5	1,2-Dichloropropane	(4)	624	(5)	<5.0	G
542-75-6	1,3-Dichloropropene	(4)	624	(5)	<5.0	G
100-41-4	Ethylbenzene	624	624	10	<5.0	G
74-83-9	Methyl Bromide	(4)	624	(5)	<5.0	G
79-34-5	1,1,2,2-Tetrachloroethane	(4)	624	(5)	<5.0	G
127-18-4	Tetrachloroethylene	624	624	10	<5.0	G
10-88-3	Toluene	624	624	10	<5.0	G
79-00-5	1,1,2-Trichloroethane	(4)	624	(5)	<5.0	G
79-01-6	Trichloroethylene	624	624	10	<5.0	G
75-01-4	Vinyl Chloride	624	624	10	<5.0	G

RADIONUCLIDES

CASRN#	CHEMICAL	EPA ANALYSIS		REQUIRED QUANTIFICATION LEVEL	REPORTING RESULTS (µg/L)	REQUIRED SAMPLE TYPE
		Required	Used			
	Strontium 90 (pCi/L)	(4)		(5)		
	Tritium (pCi/L)	(4)		(5)		
	Uranium (pCi/L)	(4)		(5)		
	Radium 226 (pCi/L)	(4)		(5)		
	Radium 228 (pCi/L)	(4)		(5)		
	Combined Ra226 & Ra228 (pCi/L)	(4)		(5)		
	Beta Particle & Photon Activity (mrem/yr)	(4)	7110B	(5)	3.8 pCi/L +/- 1.6 pCi/L	
	Gross Alpha Particle Activity (pCi/L)	(4)	7110B	(5)	0.41 pCi/L +/- 1.36 pCi/L	

ACID EXTRACTABLES

CASRN#	CHEMICAL	EPA ANALYSIS		REQUIRED QUANTIFICATION LEVEL(µg/L)	REPORTING RESULTS (µg/L)	REQUIRED SAMPLE TYPE
		Required	Used			
95-57-8	2-Chlorophenol	625	625	10	<5.0	G or C
120-83-2	2,4 Dichlorophenol	625	625	10	<5.0	G or C
105-67-9	2,4 Dimethylphenol	625	625	10	<5.0	G or C
51-28-5	2,4-Dinitrophenol	(4)	8270C	(5)	<0.354	G or C
534-52-1	2-Methyl-4,6-Dinitrophenol	(4)	625	(5)	<5.0	G or C
25154-52-3	Nonylphenol	(4)	625	(5)	<5.0	G or C
87-86-5	Pentachlorophenol	625	625	50	<5.0	G or C
108-95-2	Phenol	625	625	10	<5.0	G or C
88-06-2	2,4,6-Trichlorophenol	625	625	10	<5.0	G or C

MISCELLANEOUS

CASRN#	CHEMICAL	EPA ANALYSIS		REQUIRED QUANTIFICATION LEVEL(µg/L)	REPORTING RESULTS (µg/L)	SAMPLE TYPE USED	REQUIRED SAMPLE TYPE
		Required	Used				
776-41-7	Ammonia as NH3-N	350.1	4500NH3F	200	770, 1350, 1490	G X3	C
16887-00-6	Chlorides	(4)					C
7782-50-5	Chlorine, Total Residual	(4)		100			G
7782-50-5	Chlorine Produced Oxidant	(4)		(5)			
57-12-5	Cyanide, Free	(4)	4500CN E	10.0	<10, <10		G
94-75-7	2,4 Dichlorophenoxy acetic acid (synonym = 2,4-D)	(4)					G
1746-01-6	Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin)	1613		0.00001			G
N/A	*E. coli* / *Enterococcus* (N/CML)	(4)	ASTM D 6503-99	(5)	24.5, 54.3, <2 N/100mL	G X3	G
N/A	Foaming Agents (as MBAS)	(4)					G
6/4/7783	Hydrogen Sulfide	(4)	376.1	(5)	<50		G
14797-55-8	Nitrate as N (mg/L)	(4)					C
N/A	Sulfate (mg/L)	(4)					C
N/A	Total Dissolved Solids	(4)	2540C	(5)	308000, 330000	G X2	C
60-10-5	Tributyltin [7]	NBSR 85-3295	GC/FPD	(5)	<30 ng/L	G	G or C
93-72-1	2-(2,4,5-Trichlorophenoxy) propionic acid (synonym = Silvex)	(4)					G
	Hardness (mg/L as $CaCO_3$)	(4)	2340C	--	46000	G	G or C

	= Parameter not applicable to this facility.
	= Resulting concentration is greater than required or test method QL, or the QL determined by the laboratory is greater than the DEQ-required QL.

Ambient Water Quality - Monitoring Station
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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
07/10/68	.30	26.67		9.00	
08/13/68	.30	27.78		8.00	
09/27/68	.30	20.00		8.00	
02/04/69	.30	3.33	3.33	8.00	
05/28/69	.30	22.22		8.30	
08/22/69	.30	25.56		9.20	
02/05/70	.30	3.33	3.33	8.50	
03/10/70	.30	6.67	6.67	8.50	
04/15/70	.30	7.22	7.22	9.00	
05/11/70	.30	20.56		10.00	
06/23/70	.30	27.22		8.30	
07/06/70	.30	27.78		7.90	
08/11/70	.30	26.67		8.70	
09/30/70	.30	18.89		8.00	
11/12/70	.30	15.56	15.56	8.90	
12/07/70	.30	5.56	5.56	8.50	
06/15/71	.30	23.33		8.70	
08/18/71	.30	25.56		8.50	
10/17/71	.30	21.11		9.00	
11/15/71	.30	13.89	13.89	8.90	
05/11/72	.30	19.44		9.20	
07/23/72	.30	32.22		8.50	
08/30/72	.30	28.89		9.00	
09/07/72	.30	25.56		8.50	
10/25/72	.30	15.00	15.00	9.00	
11/02/72	.30	15.56	15.56	9.00	
12/13/72	.30	10.00	10.00	8.00	
01/05/73	.30	5.56	5.56	9.00	
02/01/73	.30	5.00	5.00	8.50	
03/21/73	.30	7.22	7.22	8.00	
04/19/73	.30	20.00		10.00	
05/07/73	.30	20.00		10.00	
10/01/73	.30	22.78		8.50	
10/31/73	.30	15.00	15.00	8.00	
12/11/73	.30	7.78	7.78	8.50	
01/02/74	.30	5.56	5.56	9.00	
02/12/74	.30	4.44	4.44	9.00	
02/28/74	.30	5.00	5.00	9.00	
04/26/74	.30	13.89	13.89	9.00	
04/30/74	.30	20.56		9.10	
06/27/74	.30	22.78		8.50	
07/09/74	.30	30.00		9.00	
07/22/74	.30	28.89		9.00	
08/05/74	.30	27.22		8.60	
08/14/74	.30	27.78		9.00	

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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
09/04/74	.30	26.67		9.00	
10/07/74	.30	18.89		8.40	
05/13/75	.30	22.22		9.50	
06/01/75	.30	27.78		8.50	
06/16/75	.30	26.11		9.00	
07/11/75	.30	27.78		8.90	
07/19/75	.30	26.11		8.10	
08/02/75	.30	28.89		8.70	
09/25/75	.30	23.89		9.00	
03/08/76	.30	12.78	12.78	9.00	
06/25/76	.30	28.33		9.00	
08/06/76	.30	26.67		9.00	
09/28/76	.30	22.78		8.00	
03/10/77	.30	9.50	9.50	9.20	
06/17/77	.30	26.00		9.00	
09/14/77	.30	2.40	2.40	9.00	
03/20/78	.30	7.00	7.00	9.00	
06/22/78	.30	28.00		9.00	
08/29/78	.30	28.00		8.50	
09/14/78	.30	23.00		9.00	
03/08/79	.30	4.00	4.00	8.50	
06/18/79	.30	26.00		7.70	
07/17/79	.30	30.00		10.00	
08/23/79	.30	25.00		9.00	
09/17/79	.30	25.00		9.00	
10/22/79	.30	20.00		8.70	
11/19/79	.30	12.00	12.00	9.40	
12/10/79	.30	6.20	6.20	7.90	
03/10/80	.30	8.50	8.50	8.70	
04/07/80	.30	15.00	15.00	9.50	
05/05/80	.30	20.00		8.60	
06/17/80	.30	23.00		7.50	
07/13/80	.30		.00		
10/16/80	.30	19.00		9.20	
11/18/80	.30	9.00	9.00	9.30	
12/18/80	.30	6.00	6.00	9.00	
03/25/81	.30	10.00	10.00	9.00	
05/12/81	.30	18.00	18.00	9.00	
06/22/81	.30		.00		
07/13/81	.30	30.00			
08/18/81	.30	26.00			
09/14/81	.30	27.00		7.80	
10/20/81	.30	15.00	15.00	8.00	
11/19/81	.30	12.00	12.00	8.00	
01/08/82	.30	3.50	3.50	8.50	

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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
03/18/82	.30	9.00	9.00	7.50	
04/29/82	.30	1.00	1.00	8.00	
06/03/82	.30	28.00		8.00	
07/13/82	.30	28.00		8.50	
08/12/82	.30	27.00		8.60	
09/16/82	.30	25.00		8.50	
10/12/82	.30	20.00		8.50	
11/30/82	.30	10.00	10.00	8.50	
12/20/82	.30	5.00	5.00	9.00	
01/20/83	.30	1.00	1.00	8.50	
03/24/83	.30	15.50	15.50	8.50	
04/14/83	.30		.00		
05/16/83	.30	20.00		9.00	
06/14/83	.30		.00	9.00	
06/24/83	.30		.00		
07/13/83	.30	27.00		9.00	
08/16/83	.30		.00	8.20	
09/21/83	.30	25.00		8.50	
10/19/83	.30		.00	8.50	
11/28/83	.30	10.00	10.00	7.80	
03/20/84	.30	7.50	7.50	9.00	
05/16/84	.30	17.00	17.00	10.00	
06/25/84	.30	19.00		9.00	
07/26/84	.30	28.00		9.00	
02/07/85	.30	3.00	3.00	7.25	
03/07/85	.30	8.00	8.00	7.50	
04/08/85	.30	14.00	14.00	8.20	
05/06/85	.30	19.70		8.20	
06/03/85	.30	23.00		8.36	
07/01/85	.30	25.00		8.20	
08/01/85	.30	26.50		7.80	
09/03/85	.30	27.00		8.00	
10/01/85	.30	22.00		8.24	
11/14/85	.30	16.00	16.00	7.87	
12/16/85	.30	6.00	6.00	8.67	
01/14/86	.30	2.00	2.00	8.63	
02/18/86	.30	7.00	7.00	7.90	
03/11/86	.30	8.00	8.00		
04/09/86	.30	14.50	14.50	7.30	
05/07/86	.30	19.00		8.66	
06/05/86	.30	23.00			
07/07/86	.30	26.00		8.20	
08/05/86	.30	29.00		8.23	
09/10/86	.30	23.40		7.80	
10/06/86	.30	24.00		8.11	

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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
11/24/86	.30	11.00	11.00	6.80	
12/15/86	.30	8.00	8.00	7.62	
01/05/87	.30	8.00	8.00	6.40	
03/03/87	.30	6.00	6.00	7.23	
03/31/87	.30	13.50	13.50		
04/30/87	.61	15.00	15.00	8.30	
04/30/87	.30	15.00	15.00	8.30	
06/02/87	.30	27.00		9.00	
07/14/87	.30	30.40		8.38	
07/14/87	.61	30.40		8.38	
08/10/87	.30	29.20			
08/10/87	.61	29.20			
09/08/87	.30	25.40			
09/08/87	.61	25.40			
10/07/87	.30	17.00	17.00	8.47	
10/07/87	.61	17.00	17.00	8.47	
11/05/87	.61		.00		
11/05/87	.30		.00		
12/08/87	.30	1.00	1.00	6.70	
12/08/87	.61	1.00	1.00	6.24	
01/25/88	.61	3.80	3.80	7.87	
01/25/88	.30	3.80	3.80	7.87	
02/09/88	.30	2.90	2.90	8.61	
02/09/88	.61		.00		
03/08/88	.30	8.60	8.60	8.02	
03/08/88	.61	8.60	8.60	8.02	
04/11/88	1.00	13.60	13.60	8.11	
05/03/88	.30	15.90	15.90		
05/03/88	.61	15.90	15.90		
06/01/88	1.00	25.00			
06/01/88	2.00	25.00			
06/30/88	.61	24.40		5.71	
06/30/88	30.48	24.40		5.71	
08/02/88	.30	28.20			
09/13/88	.30	23.10		7.96	
10/12/88	.30	16.00	16.00	8.02	
10/12/88	.91		.00		
10/12/88	.91		.00		
11/15/88	.30	12.00	12.00	8.04	
11/15/88	.30	12.00	12.00	8.04	
12/14/88	.30		.00		
01/18/89	.30		.00		
02/07/89	.30	5.90	5.90	9.01	
03/29/89	.30		.00		
04/12/89	.30	10.80	10.80	7.62	

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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
05/04/89	.30	18.10	18.10	8.98	
06/05/89	.30		.00	8.67	
07/05/89	.30		.00		
08/02/89	.30	26.30		8.40	
09/05/89	.30	24.30		8.25	
10/02/89	.30	20.60		8.21	
11/01/89	.30	17.60	17.60	8.32	
12/07/89	.30	5.70	5.70	8.44	
01/16/90	.30	.70	.70	8.75	
02/12/90	.30	8.50	8.50	8.73	
03/12/90	.30	12.10	12.10	8.70	
04/09/90	.30	8.10	8.10	9.00	
05/08/90	.30		.00		
06/11/90	.30	21.90		8.21	
07/09/90	.30	26.90		5.53	
08/21/90	.30	25.70		7.73	
08/21/90	1.00	25.70		7.73	
09/20/90	.30	21.20		8.15	
09/20/90	1.00	21.20		8.15	
10/04/90	.30	18.00	18.00	7.35	
11/06/90	.30	16.10	16.10	8.19	
12/11/90	.30	7.70	7.70	6.14	
01/02/91	.30	6.70	6.70		
02/21/91	.30	7.30	7.30		
03/12/91	.30	6.90	6.90	7.59	
04/01/91	.30	12.20	12.20	8.94	
04/30/91	.30	19.50		8.00	
06/11/91	.30	24.80			
07/11/91	.30	23.30		6.32	
10/08/91	.30	17.70	17.70	6.39	
11/07/91	.30	11.00	11.00	6.48	
12/09/91	.30	9.40	9.40	6.99	
01/07/92	.30	6.70	6.70	7.58	
02/04/92	.30	3.40	3.40		
03/05/92	.30	9.30	9.30	7.88	
04/08/92	.30	11.10	11.10	7.64	
05/11/92	.30	15.40	15.40	7.21	
06/02/92	.30	20.40		6.63	
06/30/92	.30	24.70		7.94	
08/11/92	.30	27.50		6.43	
09/10/92	.30	26.40		7.56	
09/10/92	1.00	26.40		7.56	
10/13/92	.30	17.20	17.20	8.27	
10/27/92	.30	14.40	14.40	8.58	17.50
11/12/92	.30	13.70	13.70	8.08	

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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
12/14/92	.30	6.10	6.10	8.25	16.00
12/16/92	.30	6.00	6.00	7.64	
01/11/93	.30	5.30	5.30	7.51	
02/08/93	.30	4.10	4.10	8.44	
02/17/93	.30	6.30	6.30	8.63	14.00
03/23/93	.30	8.10	8.10	8.19	
04/08/93	.30	9.60	9.60	8.20	10.50
06/09/93	.30	25.80		8.17	10.50
06/09/93	99.87		.00		
06/09/93	3.00		.00		
08/10/93	.30		.00		
10/21/93	.30	19.10		7.87	18.00
12/13/93	.30	6.02	6.02	7.80	
02/16/94	.30	2.70	2.70	8.19	13.00
04/06/94	.30	12.40	12.40	8.48	10.00
06/07/94	.30	23.10		8.08	10.00
06/07/94	2.00		.00		
08/09/94	.30	24.60		8.10	13.50
10/12/94	.30		.00		
12/15/94	.30	7.70	7.70	8.08	16.50
02/09/95	.30	.80	.80	8.85	16.00
06/12/95	.30	26.70		7.83	17.20
08/11/95	.30	28.45		8.24	19.10
08/11/95	1.00	28.00		8.20	19.30
08/11/95	4.00	26.85		7.88	19.30
08/11/95	3.00	27.00		7.96	19.30
09/13/95	.30	24.98		8.05	22.00
12/11/95	.30	4.09	4.09	7.80	21.20
03/18/96	.30	7.73	7.73	7.57	14.30
06/20/96	.30	29.50		8.65	11.80
09/19/96	.30	22.97		7.63	13.20
12/12/96	.30	6.61	6.61	7.75	12.20
03/10/97	.30	9.74	9.74	8.29	9.90
06/05/97	.30	20.56		7.66	12.90
06/06/97	.40		.00		
07/28/97	.30	28.53		7.72	15.20
09/16/97	.30	26.33		7.82	17.00
11/17/97	.30	10.03	10.03	8.05	19.10
01/13/98	.30	7.83	7.83	8.00	20.00
03/11/98	.30	8.29	8.29	8.38	13.20
05/14/98	.30	15.98	15.98	7.57	10.40
07/13/98	.30	27.20		8.26	12.20
08/12/98	1.00		.00		
08/12/98	1.00		.00		
08/24/98	1.00	28.40		8.07	16.30

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08/24/98	1.00		.00		
09/08/98	1.00		.00		
09/08/98	.30	27.01		7.93	18.80
09/08/98	2.00	27.02		7.86	18.80
09/08/98	1.00	27.02		7.90	18.80
09/15/98	.30	26.08		8.15	15.60
09/21/98	2.00	25.87		7.79	16.60
09/21/98	2.70	25.85		7.62	16.70
09/21/98	1.00	26.06		8.09	16.60
09/21/98	.30	26.61		8.17	16.40
09/21/98	1.00		.00		
10/08/98	2.90	20.94		7.87	17.30
10/08/98	1.00		.00		
10/08/98	.30	21.12		8.09	17.90
10/08/98	2.00	21.03		8.06	17.80
10/08/98	1.00	21.12		8.09	17.90
10/22/98	.30	17.74	17.74	7.71	20.50
10/22/98	1.00	17.76	17.76	7.70	20.50
10/22/98	1.70	17.73	17.73	7.64	20.50
10/22/98	1.00		.00		
11/05/98	2.10	13.41	13.41	7.68	21.80
11/05/98	1.00	13.41	13.41	7.70	21.80
11/05/98	1.00		.00		
11/05/98	.30	13.41	13.41	7.70	21.80
11/16/98	.30	12.20	12.20	8.02	19.00
11/19/98	2.70	12.44	12.44	8.05	17.60
11/19/98	2.00	12.43	12.43	8.20	17.50
11/19/98	.30	12.54	12.54	8.28	17.50
11/19/98	1.00	12.34	12.34	8.27	17.50
01/13/99	.30	3.96	3.96	7.58	21.50
03/15/99	.30	5.22	5.22	7.70	22.10
05/10/99	1.40	22.00		8.02	16.00
05/10/99	.30	22.35		8.02	16.00
05/10/99	1.00	22.20		8.02	16.00
05/12/99	.30	22.41		8.42	16.80
05/24/99	1.40	22.96		7.81	18.00
05/24/99	.30	22.98		7.92	18.00
05/24/99	1.00	22.98		7.92	18.00
06/07/99	1.00	25.73		8.55	16.70
06/07/99	.30	26.82		8.54	16.50
06/21/99	.30	22.03		8.39	17.10
06/21/99	1.50	22.01		8.36	17.10
06/21/99	1.00	22.03		8.37	17.10
07/01/99	1.00	27.20		8.20	20.00
07/01/99	.30	27.60		8.25	19.60

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Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
07/13/99	.30	25.41		8.13	17.30
07/22/99	1.40	27.95		8.19	17.70
07/22/99	.30	28.22		8.54	17.30
07/22/99	1.00	28.07		8.35	17.50
08/04/99	1.00	29.94		8.49	17.90
08/04/99	.30	29.96		8.51	17.80
08/19/99	.30	28.98		8.39	24.00
08/19/99	1.00	28.95		8.37	24.00
09/02/99	1.00	21.50		8.22	21.40
09/02/99	.30	21.51		8.23	21.40
09/14/99	.30	25.52		7.99	17.70
09/29/99	.30	23.43		7.98	22.80
09/29/99	1.00	23.01		7.92	23.10
09/29/99	1.70	22.83		7.85	23.40
10/06/99	1.00	20.17		8.06	20.70
10/06/99	.30	20.43		8.06	20.00
10/21/99	.30	17.04	17.04	7.70	17.50
10/21/99	1.10	17.11	17.11	7.69	17.50
11/08/99	.30	13.66	13.66	7.95	19.50
01/24/00	.30	1.28	1.28	7.87	19.80
03/16/00	.30	12.61	12.61	8.16	17.10
05/18/00	.30	25.06		8.21	13.20
05/23/00	1.00	21.54		8.15	14.01
05/23/00	.30	21.55		8.16	14.01
06/14/00	2.00	25.52		7.86	14.10
06/14/00	2.50	25.34		7.83	14.10
06/14/00	.30	25.75		8.01	14.00
06/14/00	1.00	25.69		7.98	14.00
07/06/00	1.00	28.89		8.22	14.00
07/06/00	.30	29.91		8.29	13.80
07/12/00	.30	27.90		8.45	14.51
08/01/00	1.00	28.58		8.54	13.00
08/01/00	.30	28.80		8.57	13.00
09/05/00	.30	25.56		7.51	14.30
09/05/00	1.00	25.60		7.50	14.20
09/07/00	.30	23.47		7.57	14.40
10/26/00	1.00	18.36		7.99	16.20
10/26/00	.30	18.76		7.99	16.20
11/07/00	.30	13.61	13.61	8.14	16.42
01/03/01	.30	1.05	1.05	7.90	20.50
03/07/01	.30	5.22	5.22	7.95	17.02
05/15/01	.30	21.50		7.77	15.60
07/17/01	.30	28.42		8.14	15.86
09/24/01	.30	24.98		7.79	17.74
11/19/01	.30	13.57	13.57	7.88	19.60

Ambient Water Quality - Monitoring Station
7-COC00161: Reedville Sanitary District (VA0060712)
2010 Permit Reissuance

Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
01/15/02	.30	5.55	5.55	7.51	20.80
04/01/02	.30	13.80	13.80	8.06	19.61
05/01/02	.30	20.31		8.10	18.52
08/28/02	.30	26.41		7.37	19.23
10/28/02	.30	15.96	15.96	7.49	21.68
02/05/03	.30	3.64	3.64	7.89	15.93
04/29/03	.30	19.64		7.96	10.90
06/11/03	.30	25.29		8.29	11.97
08/04/03	.30	28.55		8.11	12.55
10/06/03	.30	19.70		7.85	12.65
12/15/03	.30	6.30	6.30	8.44	11.80
03/11/04	.30	7.99	7.99	8.00	12.22
04/27/04	.30	19.55		8.58	11.30
06/08/04	.30	27.75		8.02	11.95
06/24/04	.30	26.54		8.42	12.58
07/08/04	.30	28.81		8.14	13.08
07/28/04	.30	27.63		7.98	12.14
08/16/04	.30	24.93		7.77	13.08
09/20/04	.30	21.63		7.96	13.83
09/27/04	.30	23.93		8.45	13.20
10/20/04	.30	16.97	16.97	8.07	11.39
11/18/04	.30	10.74	10.74	8.32	11.71
11/29/04	.30	11.14	11.14	8.61	12.60
01/31/05	.30	.49	.49	8.24	10.87
03/30/05	.30	13.56	13.56	8.27	11.14
05/09/05	.30	16.88	16.88	8.31	9.83
05/23/05	.30	21.25		8.46	10.77
06/09/05	.30	27.02		7.69	10.58
06/28/05	.30	29.51		8.31	11.90
07/18/05	.30	30.83		8.16	12.79
08/08/05	.30	31.16		8.54	13.96
09/13/05	.30	27.44		8.04	16.74
09/13/05	.30	27.44		8.04	16.74
10/25/05	.30	16.26	16.26	7.74	17.57
11/08/05	.30	16.22	16.22	8.05	16.23
11/16/05	.30	15.65	15.65	8.23	17.55
02/02/06	.30	6.84	6.84	8.31	13.72
05/23/06	.30	21.20		8.00	14.90
05/30/06	.30	26.30		8.00	15.30
06/28/06	.30	27.70		8.10	15.20
07/20/06	.30	31.30		8.30	15.40
07/26/06	.30	28.70		8.20	15.30
08/28/06	.30	29.70		8.20	16.00
08/30/06	.30	29.10		8.20	18.60
09/14/06	.30	23.20		7.30	17.60

Ambient Water Quality - Monitoring Station
7-COC00161: Reedville Sanitary District (VA0060712)
2010 Permit Reissuance

Collection Date	Depth (ft)	Temperature (°C)	Winter Temp (°C) = Data<Annual Average	Field pH	Salinity (g/kg)
10/25/06	.30	13.80	13.80	7.70	16.90
11/20/06	.30	12.50	12.50	7.90	16.60
11/27/06	.30	10.40	10.40	8.10	11.20
02/22/07	.30	5.40	5.40	7.60	13.10
04/09/07	.30	12.40	12.40	8.40	12.60
06/05/07	.30	25.30		8.10	13.00
08/23/07	.30	26.70		7.90	16.60
10/30/07	.30	17.10	17.10	7.50	19.00
12/20/07	.30	6.70	6.70	8.20	20.10
02/27/08	.30	7.10	7.10	8.20	16.80
02/29/08	.30	6.30	6.30	7.30	16.10
04/23/08	.30	17.70	17.70	8.30	12.00
06/23/08	.30	26.60		8.10	11.80
08/06/08	.30	29.30		8.20	14.00
10/09/08	.30	20.70		8.00	17.40
12/17/08	.30	7.30	7.30	8.10	18.80
01/08/09	.30	5.80	5.80	7.90	18.20
03/19/09	.30	9.10	9.10	8.00	16.50
05/14/09	.30	20.50		8.40	12.70
07/16/09	.30	27.70		8.50	14.90
09/10/09	.30	23.40		7.40	15.50
11/23/09	.30	13.20	13.20	7.70	15.30
02/22/10	.30	6.20	6.20	7.50	11.60
04/05/10	.30	17.10	17.10	8.20	10.60
90th Percentile		**28.0**	**16.1**	**9.0**	
Average	**.77**	**18.32**	**8.36**		**16.1**
10th Percentile				**7.6**	

MSTRANTI DATA SOURCE REPORT

Reedville Sanitary District: VA0060712
2011 Permit Reissuance

Stream Information	
Mean Hardness	Not applicable to salt water discharges.
90% Temperature (annual)	Calculated from data collected from monitoring station 7-COC001.61.
90% Temperature (wet season)	
90% Maximum pH	
10% Maximum pH	
Tier Designation	Flow Frequency Analysis
Stream Flows	
All Data	Flow Frequency Analysis
Mixing Information	
All Data	N/A
Effluent Information	
Mean Hardness	Not applicable to salt water discharges.
90% Temperature (annual)	Calculated or transcribed from data provided by the permittee through permit monitoring reports, application Form 2A, and Attachment A. Please note that the annual temperature value is an assumed value.
90% Maximum pH	
10% Maximum pH	
Discharge Flow	

SALTWATER AND TRANSITION ZONES
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Reedville Sanitary District Permit No.: VA0060712 Version: OWP Guidance Memo 00-2011 (8/24/00)
Receiving Stream: Cockrell Creek

Stream Information		
Mean Hardness (as CaCO3) =	*	mg/l
90th % Temperature (Annual) =	28	(° C)
90th % Temperature (Winter) =	16.1	(° C)
90th % Maximum pH =	9	
10th % Maximum pH =	7.6	
Tier Designation (1 or 2) =	1	
Early Life Stages Present Y/N =	Y	
Tidal Zone =	1	(1 = saltwater, 2 = transition zone)
Mean Salinity =	16.1	(g/kg)

Mixing Information	
Design Flow (MGD)	0.2
Acute WLA multiplier	6
Chronic WLA multiplier	14.3
Human health WLA multiplier	50

Effluent Information		
Mean Hardness (as CaCO3) =	*	mg/L
90 % Temperature (Annual) =	28	(° C)
90 % Temperature (Winter) =	16	(° C)
90 % Maximum pH =	7.9	SU
10 % Maximum pH =	6.8	SU
Discharge Flow =	0.2	MGD

* Mean Hardness does not apply to saltwater discharges.

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Acenapthene	0	--	--	9.9E+02	--	--	5.0E+04	--	--	--	--	--	--	**--**	**--**	**5.0E+04**
Acrolein	0	--	--	9.3E+00	--	--	4.7E+02	--	--	--	--	--	--	**--**	**--**	**4.7E+02**
Acrylonitrile[C]	0	--	--	2.5E+00	--	--	1.3E+02	--	--	--	--	--	--	**--**	**--**	**1.3E+02**
Aldrin [C]	0	1.3E+00	--	5.0E-04	7.8E+00	--	2.5E-02	--	--	--	--	--	--	**7.8E+00**	**--**	**2.5E-02**
Ammonia-N (mg/l) - Annual	0	1.05E+00	1.09E-01	--	6.31E+00	1.56E+00	--	--	--	--	--	--	--	**6.31E+00**	**1.56E+00**	**--**
Ammonia-N (mg/l) - Winter	0	2.28E+00	2.25E-01	--	1.37E+01	3.21E+00	--	--	--	--	--	--	--	**1.37E+01**	**3.21E+00**	**--**
Anthracene	0	--	--	4.0E+04	--	--	2.0E+06	--	--	--	--	--	--	**--**	**--**	**2.0E+06**
Antimony	0	--	--	6.4E+02	--	--	3.2E+04	--	--	--	--	--	--	**--**	**--**	**3.2E+04**
Arsenic	0	6.9E+01	3.6E+01	--	4.1E+02	5.1E+02	--	--	--	--	--	--	--	**4.1E+02**	**5.1E+02**	**--**
Benzene [C]	0	--	--	5.1E+02	--	--	2.6E+04	--	--	--	--	--	--	**--**	**--**	**2.6E+04**
Benzidine[C]	0	--	--	2.0E-03	--	--	1.0E-01	--	--	--	--	--	--	**--**	**--**	**1.0E-01**
Benzo (a) anthracene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	**--**	**--**	**9.0E+00**
Benzo (b) fluoranthene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	**--**	**--**	**9.0E+00**
Benzo (k) fluoranthene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	**--**	**--**	**9.0E+00**
Benzo (a) pyrene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	**--**	**--**	**9.0E+00**
Bis2-Chloroethyl Ether[C]	0	--	--	5.3E+00	--	--	2.7E+02	--	--	--	--	--	--	**--**	**--**	**2.7E+02**
Bis2-Chloroisopropyl Ether	0	--	--	6.5E+04	--	--	3.3E+06	--	--	--	--	--	--	**--**	**--**	**3.3E+06**
Bis2-Ethylhexyl Phthalate[C]	0	--	--	2.2E+01	--	--	1.1E+03	--	--	--	--	--	--	**--**	**--**	**1.1E+03**
Bromoform [C]	0	--	--	1.4E+03	--	--	7.0E+04	--	--	--	--	--	--	**--**	**--**	**7.0E+04**
Butylbenzylphthalate	0	--	--	1.9E+03	--	--	9.5E+04	--	--	--	--	--	--	**--**	**--**	**9.5E+04**
Cadmium	0	4.0E+01	8.8E+00	--	2.4E+02	1.3E+02	--	--	--	--	--	--	--	**2.4E+02**	**1.3E+02**	**--**
Carbon Tetrachloride [C]	0	--	--	1.6E+01	--	--	8.0E+02	--	--	--	--	--	--	**--**	**--**	**8.0E+02**

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Chlordane [C]	0	9.0E-02	4.0E-03	8.1E-03	5.4E-01	5.7E-02	4.1E-01	--	--	--	--	--	--	**5.4E-01**	**5.7E-02**	**4.1E-01**
TRC	0			--			--	--	--	--	--	--	--	**--**	**--**	**--**
Chlorine Prod. Oxidant	0	1.3E+01	7.5E+00	--	7.8E+01	1.1E+02	--	--	--	--	--	--	--	**7.8E+01**	**1.1E+02**	**--**
Chlorobenzene	0	--	--	1.6E+03	--	--	8.0E+04	--	--	--	--	--	--	**--**	**--**	**8.0E+04**
Chlorodibromomethane [C]	0	--	--	1.3E+02	--	--	6.5E+03	--	--	--	--	--	--	**--**	**--**	**6.5E+03**
Chloroform	0	--	--	1.1E+04	--	--	5.5E+05	--	--	--	--	--	--	**--**	**--**	**5.5E+05**
2-Chloronaphthalene	0	--	--	1.6E+03	--	--	8.0E+04	--	--	--	--	--	--	**--**	**--**	**8.0E+04**
2-Chlorophenol	0	--	--	1.5E+02	--	--	7.5E+03	--	--	--	--	--	--	**--**	**--**	**7.5E+03**
Chlorpyrifos	0	1.1E-02	5.6E-03	--	6.6E-02	8.0E-02	--	--	--	--	--	--	--	**6.6E-02**	**8.0E-02**	**--**
Chromium III	0			--			--	--	--	--	--	--	--	**--**	**--**	**--**
Chromium VI	0	1.1E+03	5.0E+01	--	6.6E+03	7.2E+02	--	--	--	--	--	--	--	**6.6E+03**	**7.2E+02**	**--**
Chrysene [C]	0	--	--	1.8E-02	--	--	9.0E-01	--	--	--	--	--	--	**--**	**--**	**9.0E-01**
Copper	0	9.3E+00	6.0E+00	--	5.6E+01	8.6E+01	--	--	--	--	--	--	--	**5.6E+01**	**8.6E+01**	**--**
Cyanide, Free	0	1.0E+00	1.0E+00	1.6E+04	6.0E+00	1.4E+01	8.0E+05	--	--	--	--	--	--	**6.0E+00**	**1.4E+01**	**8.0E+05**
DDD [C]	0	--	--	3.1E-03	--	--	1.6E-01	--	--	--	--	--	--	**--**	**--**	**1.6E-01**
DDE [C]	0	--	--	2.2E-03	--	--	1.1E-01	--	--	--	--	--	--	**--**	**--**	**1.1E-01**
DDT [C]	0	1.3E-01	1.0E-03	2.2E-03	7.8E-01	1.4E-02	1.1E-01	--	--	--	--	--	--	**7.8E-01**	**1.4E-02**	**1.1E-01**
Demeton	0	--	1.0E-01	--	--	1.4E+00	--	--	--	--	--	--	--	**--**	**1.4E+00**	**--**
Diazinon	0	8.2E-01	8.2E-01	--	4.9E+00	1.2E+01	--	--	--	--	--	--	--	**4.9E+00**	**1.2E+01**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	**--**	**--**	**9.0E+00**
1,2-Dichlorobenzene	0	--	--	1.3E+03	--	--	6.5E+04	--	--	--	--	--	--	**--**	**--**	**6.5E+04**
1,3-Dichlorobenzene	0	--	--	9.6E+02	--	--	4.8E+04	--	--	--	--	--	--	**--**	**--**	**4.8E+04**
1,4-Dichlorobenzene	0	--	--	1.9E+02	--	--	9.5E+03	--	--	--	--	--	--	**--**	**--**	**9.5E+03**
3,3-Dichlorobenzidine [C]	0	--	--	2.8E-01	--	--	1.4E+01	--	--	--	--	--	--			
Dichlorobromomethane [C]	0	--	--	1.7E+02	--	--	8.5E+03	--	--	--	--	--	--	**--**	**--**	**8.5E+03**
1,2-Dichloroethane [C]	0	--	--	3.7E+02	--	--	1.9E+04	--	--	--	--	--	--	**--**	**--**	**1.9E+04**
1,1-Dichloroethylene	0	--	--	7.1E+03	--	--	3.6E+05	--	--	--	--	--	--	**--**	**--**	**3.6E+05**
1,2-trans-dichloroethylene	0	--	--	1.0E+04	--	--	5.0E+05	--	--	--	--	--	--	**--**	**--**	**5.0E+05**
2,4-Dichlorophenol	0	--	--	2.9E+02	--	--	1.5E+04	--	--	--	--	--	--	**--**	**--**	**1.5E+04**
1,2-Dichloropropane [C]	0	--	--	1.5E+02	--	--	7.5E+03	--	--	--	--	--	--	**--**	**--**	**7.5E+03**
1,3-Dichloropropene [C]	0	--	--	2.1E+02	--	--	1.1E+04	--	--	--	--	--	--	**--**	**--**	**1.1E+04**
Dieldrin [C]	0	7.1E-01	1.9E-03	5.4E-04	4.3E+00	2.7E-02	2.7E-02	--	--	--	--	--	--	**4.3E+00**	**2.7E-02**	**2.7E-02**
Diethyl Phthalate	0	--	--	4.4E+04	--	--	2.2E+06	--	--	--	--	--	--	**--**	**--**	**2.2E+06**
2,4-Dimethylphenol	0	--	--	8.5E+02	--	--	4.3E+04	--	--	--	--	--	--	**--**	**--**	**4.3E+04**
Dimethyl Phthalate	0	--	--	1.1E+06	--	--	5.5E+07	--	--	--	--	--	--	**--**	**--**	**5.5E+07**
Di-n-Butyl Phthalate	0	--	--	4.5E+03	--	--	2.3E+05	--	--	--	--	--	--	**--**	**--**	**2.3E+05**
2,4 Dinitrophenol	0	--	--	5.3E+03	--	--	2.7E+05	--	--	--	--	--	--	**--**	**--**	**2.7E+05**
2-Methyl-4,6-Dinitrophenol	0	--	--	2.8E+02	--	--	1.4E+04	--	--	--	--	--	--	**--**	**--**	**1.4E+04**
2,4-Dinitrotoluene [C]	0	--	--	3.4E+01	--	--	1.7E+03	--	--	--	--	--	--	**--**	**--**	**1.7E+03**

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	5.1E-08	--	--	2.6E-06	--	--	--	--	--	--	**--**	**--**	**2.6E-06**
1,2-Diphenylhydrazine[C]	0	--	--	2.0E+00	--	--	1.0E+02	--	--	--	--	--	--	**--**	**--**	**1.0E+02**
Alpha-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	2.0E-01	1.2E-01	4.5E+03	--	--	--	--	--	--	**2.0E-01**	**1.2E-01**	**4.5E+03**
Beta-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	2.0E-01	1.2E-01	4.5E+03	--	--	--	--	--	--	**2.0E-01**	**1.2E-01**	**4.5E+03**
Alpha + Beta Endosulfan	0	3.4E-02	8.7E-03	--	2.0E-01	1.2E-01	--	--	--	--	--	--	--	**2.0E-01**	**1.2E-01**	**--**
Endosulfan Sulfate	0	--	--	8.9E+01	--	--	4.5E+03	--	--	--	--	--	--	**--**	**--**	**4.5E+03**
Endrin	0	3.7E-02	2.3E-03	6.0E-02	2.2E-01	3.3E-02	3.0E+00	--	--	--	--	--	--	**2.2E-01**	**3.3E-02**	**3.0E+00**
Endrin Aldehyde	0	--	--	3.0E-01	--	--	1.5E+01	--	--	--	--	--	--	**--**	**--**	**1.5E+01**
Ethylbenzene	0	--	--	2.1E+03	--	--	1.1E+05	--	--	--	--	--	--	**--**	**--**	**1.1E+05**
Fluoranthene	0	--	--	1.4E+02	--	--	7.0E+03	--	--	--	--	--	--	**--**	**--**	**7.0E+03**
Fluorene	0	--	--	5.3E+03	--	--	2.7E+05	--	--	--	--	--	--	**--**	**--**	**2.7E+05**
Guthion	0	--	1.0E-02	--	--	1.4E-01	--	--	--	--	--	--	--	**--**	**1.4E-01**	**--**
Heptachlor [C]	0	5.3E-02	3.6E-03	7.9E-04	3.2E-01	5.1E-02	4.0E-02	--	--	--	--	--	--	**3.2E-01**	**5.1E-02**	**4.0E-02**
Heptachlor Epoxide[C]	0	5.3E-02	3.6E-03	3.9E-04	3.2E-01	5.1E-02	2.0E-02	--	--	--	--	--	--	**3.2E-01**	**5.1E-02**	**2.0E-02**
Hexachlorobenzene[C]	0	--	--	2.9E-03	--	--	1.5E-01	--	--	--	--	--	--	**--**	**--**	**1.5E-01**
Hexachlorobutadiene[C]	0	--	--	1.8E+02	--	--	9.0E+03	--	--	--	--	--	--	**--**	**--**	**9.0E+03**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	4.9E-02	--	--	2.5E+00	--	--	--	--	--	--	**--**	**--**	**2.5E+00**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	1.7E-01	--	--	8.5E+00	--	--	--	--	--	--	**--**	**--**	**8.5E+00**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	1.6E-01	--	1.8E+00	9.6E-01	--	9.0E+01	--	--	--	--	--	--	**9.6E-01**	**--**	**9.0E+01**
Hexachlorocyclopentadiene	0	--	--	1.1E+03	--	--	5.5E+04	--	--	--	--	--	--	**--**	**--**	**5.5E+04**
Hexachloroethane[C]	0	--	--	3.3E+01	--	--	1.7E+03	--	--	--	--	--	--	**--**	**--**	**1.7E+03**
Hydrogen Sulfide	0	--	2.0E+00	--	--	2.9E+01	--	--	--	--	--	--	--	**--**	**2.9E+01**	**--**
Indeno (1,2,3-cd) pyrene C	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	**--**	**--**	**9.0E+00**
Isophorone[C]	0	--	--	9.6E+03	--	--	4.8E+05	--	--	--	--	--	--	**--**	**--**	**4.8E+05**
Kepone	0	--	0.0E+00	--	--	0.0E+00	--	--	--	--	--	--	--	**--**	**0.0E+00**	**--**
Lead	0	2.4E+02	9.3E+00	--	1.4E+03	1.3E+02	--	--	--	--	--	--	--	**1.4E+03**	**1.3E+02**	**--**
Malathion	0	--	1.0E-01	--	--	1.4E+00	--	--	--	--	--	--	--	**--**	**1.4E+00**	**--**
Mercury	0	1.8E+00	9.4E-01	--	1.1E+01	1.3E+01	--	--	--	--	--	--	--	**1.1E+01**	**1.3E+01**	**--**
Methyl Bromide	0	--	--	1.5E+03	--	--	7.5E+04	--	--	--	--	--	--	**--**	**--**	**7.5E+04**
Methylene Chloride [C]	0	--	--	5.9E+03	--	--	3.0E+05	--	--	--	--	--	--	**--**	**--**	**3.0E+05**
Methoxychlor	0	--	3.0E-02	--	--	4.3E-01	--	--	--	--	--	--	--	**--**	**4.3E-01**	**--**
Mirex	0	--	0.0E+00	--	--	0.0E+00	--	--	--	--	--	--	--	**--**	**0.0E+00**	**--**
Nickel	0	7.4E+01	8.2E+00	4.6E+03	4.4E+02	1.2E+02	2.3E+05	--	--	--	--	--	--	**4.4E+02**	**1.2E+02**	**2.3E+05**
Nitrobenzene	0	--	--	6.9E+02	--	--	3.5E+04	--	--	--	--	--	--	**--**	**--**	**3.5E+04**
N-Nitrosodimethylamine[C]	0	--	--	3.0E+01	--	--	1.5E+03	--	--	--	--	--	--	**--**	**--**	**1.5E+03**
N-Nitrosodiphenylamine[C]	0	--	--	6.0E+01	--	--	3.0E+03	--	--	--	--	--	--	**--**	**--**	**3.0E+03**
N-Nitrosodi-n-propylamine[C]	0	--	--	5.1E+00	--	--	2.6E+02	--	--	--	--	--	--	**--**	**--**	**2.6E+02**

Parameter	Background	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			**Most Limiting Allocations**		
(ug/l unless noted)	Conc.	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	**Acute**	**Chronic**	**HH**
Nonylphenol	0	7.0E+00	1.7E+00	--	4.2E+01	2.4E+01	--	--	--	--	--	--	--	**4.2E+01**	**2.4E+01**	**--**
Parathion	0	--	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**	**--**
PCB Total[C]	0	--	3.0E-02	6.4E-04	--	4.3E-01	3.2E-02	--	--	--	--	--	--	**--**	**4.3E-01**	**3.2E-02**
Pentachlorophenol [C]	0	1.3E+01	7.9E+00	3.0E+01	7.8E+01	1.1E+02	1.5E+03	--	--	--	--	--	--	**7.8E+01**	**1.1E+02**	**1.5E+03**
Phenol	0	--	--	8.6E+05	--	--	4.3E+07	--	--	--	--	--	--	**--**	**--**	**4.3E+07**
Phosphorus (Elemental)	0	--	1.0E-01	--	--	1.4E+00	--	--	--	--	--	--	--	**--**	**1.4E+00**	**--**
Pyrene	0	--	--	4.0E+03	--	--	2.0E+05	--	--	--	--	--	--	**--**	**--**	**2.0E+05**
Radionuclides	0	--	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	4.0E+00	--	--	2.0E+02	--	--	--	--	--	--	**--**	**--**	**2.0E+02**
Selenium	0	2.9E+02	7.1E+01	4.2E+03	1.7E+03	1.0E+03	2.1E+05	--	--	--	--	--	--	**1.7E+03**	**1.0E+03**	**2.1E+05**
Silver	0	1.9E+00	--	--	1.1E+01	--	--	--	--	--	--	--	--	**1.1E+01**	**--**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	4.0E+01	--	--	2.0E+03	--	--	--	--	--	--	**--**	**--**	**2.0E+03**
Tetrachloroethylene[C]	0	--	--	3.3E+01	--	--	1.7E+03	--	--	--	--	--	--	**--**	**--**	**1.7E+03**
Thallium	0	--	--	4.7E-01	--	--	2.4E+01	--	--	--	--	--	--	**--**	**--**	**2.4E+01**
Toluene	0	--	--	6.0E+03	--	--	3.0E+05	--	--	--	--	--	--	**--**	**--**	**3.0E+05**
Toxaphene [C]	0	2.1E-01	2.0E-04	2.8E-03	1.3E+00	2.9E-03	1.4E-01	--	--	--	--	--	--	**1.3E+00**	**2.9E-03**	**1.4E-01**
Tributyltin	0	4.2E-01	7.4E-03	--	2.5E+00	1.1E-01	--	--	--	--	--	--	--	**2.5E+00**	**1.1E-01**	**--**
1,2,4-Trichlorobenzene	0	--	--	7.0E+01	--	--	3.5E+03	--	--	--	--	--	--	**--**	**--**	**3.5E+03**
1,1,2-Trichloroethane[C]		--	--	1.6E+02	--	--	8.0E+03	--	--	--	--	--	--	**--**	**--**	**8.0E+03**
Trichloroethylene [C]	0	--	--	3.0E+02	--	--	1.5E+04	--	--	--	--	--	--	**--**	**--**	**1.5E+04**
2,4,6-Trichlorophenol [C]	0	--	--	2.4E+01	--	--	1.2E+03	--	--	--	--	--	--	**--**	**--**	**1.2E+03**
Vinyl Chloride[C]	0	--	--	2.4E+01	--	--	1.2E+03	--	--	--	--	--	--	**--**	**--**	**1.2E+03**
Zinc	0	9.0E+01	8.1E+01	2.6E+04	5.4E+02	1.2E+03	1.3E+06	--	--	--	--	--	--	**5.4E+02**	**1.2E+03**	**1.3E+06**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. For transition zone waters, spreadsheet prints the lesser of the freshwater and saltwater water quality criteria.
6. Regular WLA = (WQC x WLA multiplier) - (WLA multiplier - 1)(background conc.)
7. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
8. Antideg. WLA = (Antideg. Baseline)(WLA multiplier) - (WLA multiplier - 1)(background conc.)

Metal	Site Specific Target Value (SSTV)
Antimony	3.2E+04
Arsenic III	1.7E+02
Cadmium	7.6E+01
Chromium III	#VALUE!
Chromium VI	4.3E+02
Copper	2.2E+01
Lead	8.0E+01
Mercury	4.3E+00
Nickel	7.0E+01
Selenium	6.1E+02
Silver	4.6E+00
Zinc	2.2E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

4/1/2011 9:14:18 AM

Facility = Reedville Sanitary District
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 6.31
WLAc = 1.56
Q.L. = 0.2
# samples/mo. = 12
# samples/wk. = 3

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 3.14756534572944
Average Weekly limit = 2.30226684222557
Average Monthly LImit = 1.71488788052953

The data are:

9

5/20/2010 9:24:26 AM

Facility = Reedville Sanitary District
Chemical = Chromium VI
Chronic averaging period = 4
WLAa = 6600
WLAc = 720
Q.L. = 0.5
# samples/mo. = 1
# samples/wk. = 0.25

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

5/20/2010 10:25:49 AM

Facility = Reedville Sanitary District
Chemical = Copper
Chronic averaging period = 4
WLAa = 56
WLAc = 86
Q.L. = 0.5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 20
Variance = 144
C.V. = 0.6
97th percentile daily values = 48.6683
97th percentile 4 day average = 33.2758
97th percentile 30 day average= 24.1210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

20

Heptachlor

5/20/2010 10:31:39 AM

Facility = Reedville Sanitary District
Chemical = Heptachlor
Chronic averaging period = 4
WLAa = 0.32
WLAc = 0.051
Q.L. = 0.05
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = .5
Variance = .09
C.V. = 0.6
97th percentile daily values = 1.21670
97th percentile 4 day average = .831895
97th percentile 30 day average= .603026
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 7.45913139867148E-02
Average Weekly limit = 7.45913139867148E-02
Average Monthly LImit = 7.45913139867148E-02

The data are:

0.5

NOTE: The result submitted by the lab for Heptachlor was reported as <0.50 µg/L, which is above the DEQ-required QL of 0.05 µg/L. Staff contacted the lab and discovered that a transcription error was made between the analysis and the report for that pollutant. The lab sent a revised report directly to DEQ, which has been attached to this fact sheet (proceeding pages).

Primary Laboratories
Results

11-Dec-09

Date Sampled: 2-Dec-09
Work Order No: 0912022-01
Client ID: **Final Effluent Grab**

Test Description	Final Result	Reporting Limit	Units of Measure	Method Numbers*	Date Analyzed	Tech. Initials
Pesticides						
Aldrin	<0.05	0.05	ug/L	EPA 608	8-Dec-09	HV
Chlordane	<0.20	0.20	ug/L	EPA 608	8-Dec-09	HV
Dieldrin	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
4,4-DDT	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
4,4-DDE	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
4,4-DDD	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endosulfan sulfate	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endosulfan I	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endosulfan II	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endrin	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Alpha-BHC	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Beta-BHC	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Gamma-BHC (Lindane)	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Heptachlor	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Kepone	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Methoxychlor	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Mirex	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endrin Aldehyde	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Heptachlor Epoxide	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Hexachlorocyclohexane	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
PCB 1016	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1221	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1232	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1242	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1248	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1254	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1260	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
Toxaphene	<5.0	5.0	ug/L	EPA 608	8-Dec-09	HV

* All methods are Standard Methods 18th Edition unless otherwise noted.

Signature: _____ Date: 12/11/09

Parry L. Bragg
Laboratory Manager

Primary Laboratories
Results

13-Dec-10

Date Sampled: 2-Dec-09
Work Order No: 0912022-01
Client ID: **Final Effluent Grab**

Test Description	Final Result	Reporting Limit	Units of Measure	Method Numbers*	Date Analyzed	Tech Initials
Pesticides						
Aldrin	<0.05	0.05	ug/L	EPA 608	8-Dec-09	HV
Chlordane	<0.20	0.20	ug/L	EPA 608	8-Dec-09	HV
Dieldrin	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
4,4-DDT	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
4,4-DDE	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
4,4-DDD	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endosulfan sulfate	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endosulfan I	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endosulfan II	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endrin	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Alpha-BHC	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Beta-BHC	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Gamma-BHC (Lindane)	<0.50	0.50	ug/L	EPA 608	8-Dec-09	HV
Heptachlor	<0.05	0.05	ug/L	EPA 608	8-Dec-09	HV
Kepone	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Methoxychlor	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Mirex	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Endrin Aldehyde	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Heptachlor Epoxide	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
Hexachlorocyclohexane	<0.10	0.10	ug/L	EPA 608	8-Dec-09	HV
PCB 1016	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1221	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1232	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1242	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1248	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1254	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
PCB 1260	<1.0	1.0	ug/L	EPA 608	8-Dec-09	HV
Toxaphene	<5.0	5.0	ug/L	EPA 608	8-Dec-09	HV

* All methods are Standard Methods 18th Edition unless otherwise noted.

Signature: _____ Date: 12/13/10

Parry L. Bragg
Laboratory Manager

5/19/2010 3:12:24 PM

Facility = Reedville Sanitary District
Chemical = TRC/Chlorine Producing Oxidants
Chronic averaging period = 4
WLAa = 78
WLAc = 110
Q.L. = 100
# samples/mo. = 90
# samples/wk. = 21

Summary of Statistics:

observations = 1
Expected Value = 20000
Variance = 1440000
C.V. = 0.6
97th percentile daily values = 48668.3
97th percentile 4 day average = 33275.8
97th percentile 30 day average= 24121.0
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 78
Average Weekly limit = 40.6154400693973
Average Monthly LImit = 35.8669485045286

The data are:

20000

05/20/2010 1:48:03 PM

Facility = Reedville Sanitary District
Chemical = Zinc
Chronic averaging period = 4
WLAa = 540
WLAc = 1200
Q.L. = 2.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 17
Variance = 104.04
C.V. = 0.6
97th percentile daily values = 41.3680
97th percentile 4 day average = 28.2844
97th percentile 30 day average= 20.5029
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

17

Attachment F

Letter from Permittee Addressing Nutrients

Northumberland County, Virginia

Board of Supervisors

P.O. Box 129 • 72 Monument Place
Heathsville, Virginia 22473

COUNTY ADMINISTRATOR

Kenneth D. Eades
Heathsville, VA 22473
804-580-7666 (Voice)
804-580-7053 (Fax)
keades@co.northumberland.va.us

COUNTY ATTORNEY

W. Leslie Kilduff, Jr.
804-435-0851 (Voice)
804-435-0551 (Fax)

May 10, 2010

Mr. Jeremy Kazio
Environmental Engineer Sr.
Department of Environmental Quality
4949-A Cox Road
Glen Allen, Virginia 23060

Dear Mr. Kazio:

I appreciate you meeting with myself and representatives form Resource International, Ltd, Charlie Riedlinger, and Meredith Winn, on the permit for the Reedville sewer system. I hope that the tour of the facility was helpful. We are striving to get the plant in compliance with the nutrient removal deficiencies and studies have led to the conclusion that it is impossible to fund a major project without substantial grant funds. The existing customer base cannot financially support a major plant upgrade. Therefore, the County's course of action will be to delay any construction for at least five years while establishing new rates that will provide money to escrow for a use on a future plant upgrade.

Our immediate plan of action is to purchasing nitrogen and phosphorus credits, to meet the Chesapeake Bay standards. We will also be working on the plant operating process to meet current regulatory requirements. These operational improvements may include the use of chemicals and more frequent sludge drawdown from the digester to reduce the phosphorus concentrations.

If you have any questions or concerns feel free to contact me. With these additional items I am now requesting that you issue the new permit. Thank you very much.

Sincerely,

Kenneth D. Eades
County Administrator

Attachment G

2003 Email Permitting Grab Sampling in Lieu of Composite Sampling

Mosca,Denise

From: Linderman,Curt
Sent: Wednesday, August 27, 2003 10:12 AM
To: Mosca,Denise
Subject: RE: Town of Reedville Permit Sampling

ok. Sounds reasonable. Please include narrative explaining the basis for the change in their Fact Sheet. Thanks.

-----Original Message-----
From: Mosca,Denise
Sent: Wednesday, August 27, 2003 10:06 AM
To: Linderman,Curt
Subject: RE: Town of Reedville Permit Sampling

The sampling is performed after the polishing pond. They discharge every day for about 3.5 hours.
Denise

Denise M. Mosca
Environmental Engineer Sr.
DEQ-Kilmarnock Field Office
P.O. Box 669
Kilmarnock, Va. 22482
804-435-3181
fax 804-435-0485

-----Original Message-----
From: Linderman,Curt
Sent: Monday, August 25, 2003 11:28 AM
To: Mosca,Denise
Subject: RE: Town of Reedville Permit Sampling

Is the sampling performed prior to the polishing pond or after? If after, is it a continual or intermittent discharge?

-----Original Message-----
From: Mosca,Denise
Sent: Thursday, August 21, 2003 4:08 PM
To: Linderman,Curt
Subject: Town of Reedville Permit Sampling

Hi, we approved this facility to submit grab samples for the application instead of composites (e.g., for BOD/TSS/etc.) because they have a polishing pond at the end of their treatment train which has a 7-15 day retention time. That was in accordance with the directions in the VPDES 2A application. Accordingly, the Town's consultant has asked if we might substitute grab samples rather than composite samples when we write their draft permit. The permit manual on page MN-68 recommends 8 hr. composites for facilities of a design flow of 0.2 MGD. The direction is written as a "recommendation." I don't see why the logic would not hold for sampling under the terms of the permit as well as the permit application (which is traditionally more rigorous than the permit for use in screening), so I think we should approve their request.
thanks,
Denise

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